A15312756 24 ID: 88081463

SB 612 .W8 R62 1980

WSO LIBRARY

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

ROCK SPRINGS DISTRICT

WEED CONTROL PROGRAM

ENVIRONMENTAL ASSESSMENT

BACKGROUND AND INTRODUCTION

Weeds and pests can cause severe economic losses by reducing agricultural yields. The Wyoming State Legislature recognized a need to reduce such losses by controlling detrimental weeds and pests.

The Wyoming Weed and Pest Control Act of 1973 established weed and pest control districts in each county of Wyoming and provided that the districts be individually governed by a district board. Each board is responsible for implementing and pursuing effective control programs to minimize the impact of designated weeds and pests (1).

District boards are authorized by the Legislature to prescribe minimal treatment regardless of land ownership (federal, state, municipal or private). The law requires landowners to implement treatment on land identified as having noxious weed populations and potential seed dispersal sources. The intent of the legislation is to ensure control and containment of noxious weeds.

Federal, state and district cost-sharing programs are available to help landowners with expenses incurred implementing control of noxious weeds. The Act, W.S. 11-5-102 (a) (xi), defines a designated noxious weed as, "the weeds, seeds or other plant parts that are considered detrimental, destructive, injurious, or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within this state and are on the designated list."

The Wyoming Department of Agriculture and the Weed and Pest Districts of Lincoln, Sublette, Sweetwater and Uinta Counties conducted systematic weed surveys on Bureau of Land Management land in 1976. Survey results identified infestations of seven designated noxious weed species on BLM administered public land in the Rock Springs District (Table 1). Other weed species infest BLM land but are not designated as noxious and will not be considered in this report.

Table 1. Designated noxious weeds and acreage identified during the 1976 survey on lands under the jurisdiction of the BLM Rock Springs District, Wyoming

Common Name	Scientific Name	Acres
Perennial pepperweed	(Lepidium latifolium)	620.50
Canada thistle	(Cirsium arvense)	473.00
Musk thistle	(Carduus nutans)	130.50
Hoary cress	(Cardaria draba)	22.00
Leafy spurge	(Euphorbia esula)	15.00
Russian knapweed	(Centoures repens)	2.00
Plumeless thistle	(Carduus acanthoides)	.03
Total Acres		1263.03

The Bureau of Land Management, Rock Springs District boundaries encompass 14,597,872 acres of private, state and federal land. Approximately 40 percent or 5,804,853 acres of this land is federal land administered by the BLM, Rock Springs District.

Weed and Pest District surveys conducted in 1976 (Appendix 2) indicated that the designated noxious weed species listed in Table 1 infest approximately 1,263 acres of BLM administered land in the Rock Springs District. The weed species and areas where these weeds are present are indicated in Fig. 1. Estimated acreage infested by weeds in each county are shown in Table 2.

The estimated percent of acreage increase shown in Table 2 up-dates the four-year-old surveys and indicates the spread of the existing infestations. The estimates were provided by the individual county weed and pest district supervisors (3).

Table 2. The weed infested acres, by county, in 1976 and the estimated percentage increase[1] since the 1976 survey.

County	Weed Infested Acres (1976)	Estimated Percent Increase	Estimated Total Acres
Lincoln	307.500	100%	615.00
Sublette	101.689	20%	122.03
Sweetwater	575.012	22%	684.00
Uinta	279.054	30%	362.77
Total	1,263.255		1783.80

[1]The estimated percentage increase indicates the approximate increase in size and number of weed infestations (acres) since the 1976 surveys were conducted.

The weed control areas depicted in Fig. 1 are not accurate representations of the size of the infestations but depict weed distribution throughout the district.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

PROPOSED ACTION - INTEGRATED PEST MANAGEMENT

The Weed and Pest Control Districts and the Wyoming State Department of Agriculture have proposed a cooperative agreement with the BLM to control and contain the weed species listed in Table 1. The BLM is ultimately responsible for implementation of the proposed weed control program. Coordinating activities such as water quality sampling and permit acquisition

would be the responsibility of the Wyoming State Department of Agriculture.

The purpose of the proposed weed control and containment program is twofold:

To reduce present and future economic losses to ranchers and farmers caused by reduced crop yields, lowered rangeland productivity, and costly weed control efforts. These losses could be reduced by controlling the designated noxious weeds which are dispersal sources on all land.

To comply with state and federal laws. Federal law restricts interstate shipping of contaminated products and addresses itself to weed infestations on federally owned land (Carlson-Foley, 90-583). The Wyoming Weed and Pest Act applies to all infested land within the state - private, state or federally owned. Both state and federal laws have quarantine provisions that can be used as enforcement measures (Appendix 7).

Control efforts used will constitute an interdisciplinary approach to minimize infestations of unwanted plants. This type of weed management system (WMS) also termed integrated pest management (IPM), combines the uses of preventive, physical, herbicidal and biological control measures and management practices.

The IPM components will be defined individually and later discussed at length, but, separately, they do not meet the objectives of the proposed action, i.e., the control and containment of weeds.

Components of the Proposed Action (IPM)

Preventive Control Measures: Preventive measures are those which reduce or prevent the spread of weeds. Preventive measures applicable to the Rock Springs District include the management of wildlife and farm animals, irrigation and drainage systems, grazing and land reclamation practices, and the use of certified seed.

Physical Control Measures: Physical weed control methods include mechanical or hand tillage, mowing and cutting, prescribed burning and smothering with non-living mulches such as straw or sawdust.

Biolgoical Control Methods: Biological control of noxious weed species involves the use of natural living organisms--parasites, pathogens and predators--to reduce the population of a pest species.

Herbicide Control: Herbicides are chemicals that kill plants or alter their normal growth. As the use of herbicides can be the most effective and cost efficient means of controlling existing weed infestations, this component will be discussed in detail later in this report.

Management Practices: Management practices coordinate use of the above control procedures, coordinate grazing rotation systems with weed control efforts, direct reseeding efforts, prioritize areas to be treated, address cost sharing issues and cooperative control programs on state, federal and local levels. Management also develops, administers and coordinates educational programs designed to train landowners and field operators on the "how-to" of weed control.

The proposed system of weed management should be viewed as the initial phase of an integrated approach to weed control in the BLM Rock Springs District. To be effective, the control plan must be applied in an orderly manner, subject to frequent reappraisal and modification and with the cooperation of all landowners having infested property (2).

Integrated pest management systems are tailored to the individual weed species or weed complexes under various habitat types and conditions. Therefore, no two weed management programs are the same.

Variables that play an important role in determining which control measures to use in a given area are:

The characteristics of the weed species (annual, biennial, perennial).

Location of the infestation (cropland, rangeland, riparian, roadside).

Proximity of infestation to sensitive areas (threatened plant or animal species and unstable watersheds).

Areas with existing land management plans that conflict with weed control efforts.

These variables interact from one weed location to another enhancing the possibility of combining two or more control measures.

A. Preventive Control

Certain preventive techniques are applicable throughout the Rock Springs District. They would reduce or prevent the introduction and dispersal of weeds. To attain long-range success of a weed management program, emphasis of preventive measures to contain weed species in a locality are a necessity. Such measures should begin at the early stages of a weed management program.

There are many preventive control measures that can be prescribed for specific weed problems. Certain wildlife and livestock management techniques could be implemented to minimize the spread and dispersal of existing weed infestations. Methods proposed for the Rock Springs District follow.

Livestock Management: Many weeds are disseminated by weed seeds that adhere to the hair and feet of animals or pass through their digestive tracts. Livestock managers can help reduce the spread of weeds by properly managing animal transportation. Attention should be given to livestock handling at loading and unloading points and to the proper disposal of manure and bedding

that accumulates in trucks. Hay and feed should be chosen not only for quality, but also for cleanliness with respect to weed seeds. These factors are applicable not only for livestock operators but recreationists transporting horses and pack animals to the Rock Springs District.

Wildlife Management: While wildlife is not subject to the precise management control as is domestic stock, there are; nevertheless, techniques which may be applied. Exclusions of game animals from specifically treated small areas may be necessary to enhance recovery of desirable plants. Hunting seasons and bag limits can be liberalized or restricted in areas to aid in the control of weeds. One very important practice related to wildlife management is the surveillance of feed and bedding used by hunters and other recreationists. These materials should be inspected for cleanliness in respect to weeds and weed seeds.

District managers of the BLM and county weed and pest supervisors will cooperate in scheduling inspections of farm products.

Irrigation and Drainage System Management: A major source of infestation on farm lands is weed dispersal via irrigation systems traversing private, state and federal land. Many weed seeds, corms, rhizomes, and vegetative propagules are light and readily float or remain suspended in moving water. Early detection and eradication of existing weed infestations in irrigation systems is paramount in importance if containment of the designated noxious weeds is to be achieved. Cooperation among private, state and federal landowners is essential if the irrigation systems are to become weed free.

The BLM in cooperation with the Agricultural Extension Service and the county weed and pest supervisors would develop a program aimed at educating

all landowners of the importance of cooperative weed control efforts in irrigation systems and to identify and control existing weed infestations along irrigation systems.

B. Physical Control

Choice of a physical control method depends upon the characteristic of the target weed species (growth, habitat and life span) and on the accessibility of the weed infestation.

Tillage methods, fire, mowing and cutting and smothering techniques work well with annual and biennial weeds (Musk thistle and Plumeless thistle). Biennial weeds are also responsive to hand grubbing. Perennial weeds such as Canada thistle, Perennial pepperweed, Hoary cress, Leafy spurge and Russian knapweed are difficult to control with hand grubbing and other tillage methods due to their rhizomatous root systems that allow for significant vegetative reproduction.

Tillage, fire and mowing control weeds in two ways. Properly timed, these methods prevent plants from producing seeds and repeated efforts can deplete the underground food supply of some perennials (2). Other perennials are more resistant to the depletion of underground food reserves and require as many as three control efforts per year for up to three years.

Most weeds should be tilled, burned or cut in the bud stage or earlier to prevent the production of viable seed that can occur as early as the flowering stage. Perennial weeds should be tilled, burned or cut in the early bloom stage when underground food reserves are lowest.

Smothering techniques work well on small annual or biennial weed infestations but are ineffective on most perennial weed infestations.

Most physical control methods have limited usefulness in the Rock Springs District as the majority of weed species to be controlled are perennials located in riparian areas and in inaccessible terrain.

C. Biological Control

Research is being conducted on the biological control organisms of four weed species infesting the Rock Springs District. The weed species being studied are, Canada thistle, Musk thistle, Leafy spurge, and Russian knapweed.

The long-range effectiveness of biological control agents depends on the organisms ability to affect both the top growth of a plant and the root system. Organisms that feed on only the top growth do not prevent the plant from root propagation. Root-feeding organisms do not stop the seed dispersal of the top growth.

Oberea erythrocephala, a cerambycid beetle, would seem to meet the criteria of an effective biological control agent of Leafy spurge. In the summer, the adult beetle girdles the plant causing the top portion to break off. In August, the female lays her eggs in the stem of the plant and the larvae hatch and mine down into the roots of the plant, feeding and wintering in the roots. The new adults emerge in the summer continuing the cycle.

The U.S.D.A. has cleared Oberea erythrocephala for use in Wyoming (4). Initial tests indicate O. erythrocephala may not survive in the state. Research is needed to determine the usefulness of O. erythrocephala as a control agent for Leafy spurge in Wyoming. The Rock Springs District has identified the presence of only 15 acres of Leafy spurge. Thus, other methods of eradicating the species would be more economically feasible than establishing research

study plots using Oberea erythrocephala.

Biological control research programs are being conducted on the weevil (Rhinocyllus conicus) which feeds on the seed heads of Musk thistle. Research on this species was conducted in Sybille Canyon in Albany County, Wyoming 1975-1976. Good control of Musk thistle was observed. The most recent study was established in May, 1979 in the Big Horn Basin of Wyoming.

Initial research conducted in Wyoming indicates that R. conicus is a fairly effective biological control organism (5,6). R. conicus has been approved as a control agent and can be considered as one method of helping to control Musk thistle infestations in the Rock Springs District (4).

Research areas using R. conicus would first be established in three locations (Table 3, Fig. 2).

Table 3. Study areas for the biological control of Musk thistle

Weed Species (Survey No.)	County	Quadrangle	Legal Description	Acres
Musk thistle (005)	Lincoln	Sage, Wyoming	T24NR118W Sec. 25,26	2.500
Musk thistle (006)	Lincoln	Sage, Wyoming	T23NR118W Sec. 11,12, 13	2.000
Musk thistle (220)	Sublette	Meadow Canyon SW	T29NR114W Sec. 5	5.000

Painted-lady butterfly larvae are being studied as control agents of Canada thistle, however, the population peaks of the butterfly are infrequent (every 15-20 years), rendering it an ineffective control agent at this time.

The nematode Paranquina picridis has been studied in Canada as a control agent of Russian knapweed (7). Its effectiveness as a deterrent to Wyoming

infestations can only be determined through further research.

D. Herbicide Control

Often the only effective method available to control existing severe noxious weed infestations, especially perennial weeds, is the use of herbicides. Therefore, the use of herbicides will be the major part of this IPM program. The herbicide control program outlined in this action will be implemented throughout the Rock Springs District excluding those areas identified in the biological control, grazing and special management techniques sections of this action. Figure 3 indicates the areas of the proposed program where special application techniques, use of biological control organisms, research study plots, monitoring and specific rehabilitation techniques are to be implemented.

The site specific areas proposed for treatment are described in Tables 1-4 in Appendix 2. The tables also list additional information of proposed treatment formulations, application methods, and optimum phenotypic growth stage for treatment. The USGS topographic maps referenced in the tables were used to record the 1976-77 weed survey information. These maps are available for review in the respective weed and pest supervisor's offices (Appendix 3).

The Weed and Pest Control District Board, in compliance with WS 11-5-105, proposed to "implement and pursue an effective program for control of designated noxious weeds..." in the Rock Springs District by treating the present weed infestations with the herbicides Tordon, Banvel, Roundup and 2,4-D amine formulations (1).

Table 4 presents a summary of the weed species present in the Rock Springs District, the various formulations of the four herbicides and application

methods that would be used to control the individual weed species. The weed treatment program would begin in the early spring 1981 and continue for four years with a continued maintenance program extending beyond 1985.

It is not intended to treat the total acreage of weed infestation in each county the initial year of the program. Table 5 presents a summary of the estimated percentage of the total acreage that would be treated initially each year of the five-year program. Treatment is expected to be effective but some re-treat and follow-up effort is anticipated. It is estimated that 25 percent of the acreage will require re-treatment following the initial application.

The following discussions present the specific details pertaining to the herbicide formulations and application methods that would be used in the treatment and re-treat and follow-up efforts.

Proposed Herbicide Formulations: Tordon, Banvel, 2,4-D amine, Roundup and a tank mix of Tordon plus 2,4-D amine are the herbicides proposed for use in weed treatment. The formulations, application rates, EPA registration numbers, and other pertinent information are presented in Tables 6 and 6a.

Herbicide Application Methods: Different methods are proposed to apply herbicide to the designated noxious weed infestations. The application method chosen for use is always contingent on the weather conditions, type of vegetation cover, vegetation zone (i.e. riparian or non-riparian) topography, and the size of the weed infestation in a given area. The application methods proposed for treatment of each weed species is given in Table 4. Site specific application methods proposed are given to the individual county weed control program tables in Appendix 2. Specific descriptions of each method follows:

1. Aerial Application:

A helicopter would be used for all aerial application. Liquid formulations of 2,4-D amine will be applied. Application

Table 4. Application Methodology and Herbicide Formulations Proposed for use on the seven Weed Species

	Aerial Application	Vehicular Mounted		Hand Application Methods		
	Liquid Formulation	Boom Spray	Hand Gun Spray	Hand Spray	Bead Appli.	Wick Appli.
Perennial pepperweed	III(NR,R)	III(NR,R)	III(NR,R)	III(NR)		
Canada thistle		I,II,IV(NR)	I,II IV(NR)	I,II,III(R) I,II,IV, V, (NR)	I,II(R)	V(R)
Musk thistle		IV(NR)	IV(NR)	I,IV(NR)	II(R)	
Plumeless thistle		IV(NR)	IV(NR)	II(R) IV(NR)	II(R)	
Hoary cress		III(NR)	III(NR,R)	III(NR,R)		
Leafy spurge		I(NR)	I(NR)	II(R) I(NR)	II(R)	
Russian knapweed				III(R) I(NR)		

I - Tordon 22K and/or Tordon 2K
II - Banvel and/or Banvel 5g
III - 2,4-D amine
IV - Tordon 22K and 2,4-D amine tank mix
V - Roundup
R - Riparian areas
NR - Non-Riparian areas (Rangeland)

Table 5. Estimated acreage of weed infested land proposed for control from 1981 - 1985.

Year	Estimated treatment effort each year				
	1981	1982	1983	1984	1985
Lincoln	20% (123 acres)	20% (123 acres) Retreat and Follow-up	20% (123 acres) Retreat and Follow-up	20% (123 acres) Retreat and Follow-up	20% (123 acres) Retreat and Follow-up
Sublette	33% (34 acres)	33% (34 acres) Retreat and Follow-up	34% (34 acres) Retreat and Follow-up	Retreat and Follow-up	Retreat and Follow-up if necessary
Sweetwater	20% (137 acres)	20% (137 acres) Retreat and Follow-up	20% (137 acres) Retreat and Follow-up	20% (137 acres) Retreat and Follow-up	20% (136 acres) Retreat and Follow-up
Uinta	33% (121 acres)	33% (121 acres) Retreat and Follow-up	34% (121 acres) Retreat and Follow-up	Retreat and Follow-up	Retreat and Follow-up if necessary

Table 6. Specific herbicide formulation and application information.

Herbicide Formulation	Trade Name	Common Name	Chemical Name	Registration (see labels)
1. Tordon 22K	Tordon	Picloram	4-amine-3,4,5 Trichloropicolinic acid	EPA #464-07087-WY Rangeland, Permanent Grass Pasture
2. Tordon 2K	Tordon	Picloram	4-amine-3,4,5 Trichloropicolinic acid	EPA #464-333-AA
3. Banvel	Banvel	Dicamba	3,6-Dichloro-0-aminic acid	EPA #876-25-AA
4. Banvel 5g	Banvel	Dicamba	3,6-Dichloro-0-aminic acid	EPA #876-103-AA
5. 2,4-D amine	N/A	2,4-D amine salt	2,4-Dichlorophenoxy acetic acid	EPA Nos. 464-1-AA 1990-102 677-296-A 359-331-AA
6. Roundup	Roundup	Glyphosate	N-(Phosphonomethyl glycins	EPA #524-308-AA
7. Tank mix Tordon & 2,4-D amine	Tordon &	#1 and #5	N/A	#1 and #5

Table 6a. Specific herbicide formulation and application information.

Herbicide Formulation	AI/GAL or/lb. (Carrier)	Application Rates	Weed Species Recommended For Treatment
1. Tordon 22K	2 lbs/gal. (water)	¼-2 lbs. AI/A (5 to 150 gal. H_2O/acres)	Canada thistle, Musk thistle, Russian knapweed, Leafy spurge
2. Tordon 2K	2%/lb. (ammonium nitrate)	½-2 lbs. AI/A (.313-.625 lbs/rd^2)	Canada thistle, Musk thistle, Russian knapweed, Leafy spurge
3. Banvel	4 lbs./gal. (water)	1-8 lbs. AI/A (5 to 150 gal. H_2O/acre)	Canada thistle, Musk thistle, Leafy spurge, Plumeless thistle, Russian knapweed
4. Banvel 5G	5%/lb. (Attaclay)	1-8 lbs. AI/A (40-160 lbs. granules/acre	Canada thistle, Musk thistle, Leafy spurge, Plumeless thistle, Russian knapweed
5. 2,4-D amine	4 lbs./gal. (water)	2-6 lbs. AI/A (5 to 150 gal. H_2O/acre)	Canada thistle, Musk thistle, Hoary cress, Russian Knapweed, Perennial pepperweed
6. Roundup	4 lbs/gal. (water)	.5-3 lbs. AI/A	Canada thistle, Musk thistle
7. Tank mix Tordon & 2,4-D amine	#1 and #5 (water)		Canada thistle, Musk thistle, Plumeless thistle

the spray boom would only be used where feasible.

The spray boom would be used to treat solid weed infestations larger than 50 X 50 feet. The hand spray gun would be used up to the high water line and for spot treatment of weed infested areas of less than 50 X 50 feet. With both methods sprays would be applied at a height of 1.5 to 2 feet when wind velocity is below 6 m.p.h., except in riparian areas where treatment would only be conducted when wind velocity is below 4 m.p.h.

3. Hand application methods for liquid and granular formulations:

Liquid formulations such as Tordon 22K, Banvel 4WS and 2,4-D can be applied with backpack mounted hand sprayers. This type of hand sprayer is equipped with a single low volume (30-40 p.s.i.) nozzle. Spray would be applied at .5 to 1.5 feet above the ground when wind velocity is below 8 m.p.h., except near live water and other aquatic sites, where treatment would be conducted when velocity is below 4 m.p.h.

Granular formulations such as Tordon 2K and Banvel 5G can be applied by hand, using whirl-plate spreaders or shaker type granular applicators. Application of granular herbicide formulations with spreaders or shakers would be made at approximately 3.5 feet above the ground surface and only when the wind velocity is below 8 m.p.h. However, near live water or other aquatic sites, treatment would be conducted when wind velocity is below 4 m.p.h.

4. Wipe application method for liquid formulations:

Liquid formulations such as Roundup or 2,4-D amine would be used near live water and other aquatic sites, particularly environmentally sensitive areas and where weeds overhang waterways. The herbicide solution would be wiped on the individual plants to be controlled.

The hand application methods described previously are all intended for use in rough, unaccessible terrain and in riparian areas or other sensitive aquatic sites. All application equipment would be assembled, calibrated and maintained in compliance with the pesticide manual (Appendix 4) and the University of Wyoming, Weed Science Department.

The herbicides would be applied only during favorable, climatic conditions. Weather would be monitored on a daily basis and all available weather information

would be utilized. A wind gauge would be used to monitor the wind velocity when utilizing all application techniques except the wipe application method.

Herbicide Application Rates: Table 6 and 6a present specific information pertaining to each herbicide formulation with maximum and minimum application rates listed in column 3 in Table 6a. Generally, the proposed herbicides would be applied at the rates recommended in the current Wyoming Weed Control Guide (Appendix 5) as published by the University of Wyoming Agricultural Extension Service. In all instances application rates would be within the specific label requirements for each herbicide.

Application rates of Tordon, Banvel, Roundup and 2,4-D amine formulations would not exceed 2, 8, 3 or 6 pounds active ingredient per acre, respectively, during a single growing season. To avoid over application, Tordon would not be applied above label limitations to a site during a single growing season. Tank mix application rates would not exceed the maximum rate allowed for the individual herbicides.

Time of Application: Plant growth stage is an important factor to consider in order to achieve the desired phytotoxic affect on the plant treated. When some weed species reach mature growth stages, they become resistant to the herbicides; therefore, to achieve effective control, application during early growth stages (bud to rosette) is best. Table 7 indicates the optimum phenotypic growth stage for treatment of the seven weed species proposed for control in the Rock Springs District.

In non-riparian zones, depending upon the characteristics of the target weed species and herbicide used, treatment can be accomplished any time from May through October. In riparian zones (near perennial, ephemeral and still waters) treatment times may not correlate with the optimum plant

Table 7. Optimum phenotypic growth stage and month(s) for treatment of weed with the specific herbicides.

Weed Species	Growth Stages				
	Tordon	Banvel	2,4-D	Tordon & 2,4-D Tank	Roundup
Canada thistle	Bud stage (June - Sept.)	Early bud stage or maturity (June and/or Sept. - Oct.)	Bud stage (June - July)	Bud stage (June - Sept.)	Early bud stage (June - July)
Musk thistle	Rosette stage in fall or before flowering stalk lengthens in spring (June - July) (Aug. - Sept.)	Rosette stage in fall or before flowering stalk lengthens in spring (June - July) (Aug. - Sept.)	Rosette stage in fall or before flowering stalk lengthens in spring (June - July, Aug. - Sept.)	Rosette stage in fall or before flowering stalk lengthens in spring (June - July, Aug. - Sept.)	Rosette stage in fall or before flowering stalk lengthens in spring (June - July, Aug. - Sept.)
Plumeless thistle		Rosette stage in fall or before flowering stalk lengthens in spring (June - July, Aug. - Sept.)		Rosette stage in fall or before flowering stalk lengthens in spring (June - July, Aug. - Sept.)	
Leafy spurge	Bud stage (June - Sept.)	Bud to bloom stage (June - July) (Sept. - Oct.)			
Russian knapweed	Bud to maturity (June - Sept.)	Bud to bloom stage good soil moisture (June - July)			
Hoary cress			Bud stage (June - July)		
Perennial pepper-weed			Bud to bloom (May - July)		

growth stage because of high water and other environmental concerns. Weed treatment operations utilizing hand application techniques other than the wipe application method would not be conducted along any stream until spring run-off waters recede to normal levels. See Tables 1-4 in Appendix 2 for approximate proposed treatment dates.

Re-treatment and Follow-up Program: Tordon, Banvel, Roundup and 2,4-D are effective herbicides when applied as recommended, but re-treatment and follow-up efforts will be necessary.

In general, each of the four herbicides are proposed for use in a re-treatment and/or follow-up program. The specific guidelines listed below would be employed in re-treatment and follow-up programs:

TORDON

If the initial application used the maximum 2 lb. rate, care would be taken not to use the maximum rate for re-treatment in the next year.

In areas where Tordon concentration is uncertain, soil samples will be taken and sent to the Wyoming Department of Agriculture for analysis.

BANVEL

Banvel would be used in re-treatment and follow-up programs in the year following initial applications. Where Banvel is used to control Leafy spurge, two treatments in the initial year of application (one spring and one fall) would be necessary to achieve adequate top growth control. Label limitations would be followed.

2,4-D AMINE

2,4-D would be used for initial treatment and re-treatment of Hoary cress and Perennial pepperweed. Adequate control requires 2 treatments in the same growing season. Re-treatment may follow the initial application by 30-90 days and would not exceed annual label limitations.

ROUNDUP

Roundup would be used in the re-treatment and follow-up programs where it was initially used.

If the herbicide used in the initial application proved ineffective, any of the other three herbicides would be substituted in re-treatment and follow-up programs.

E. Management Practices

There are a number of management practices which would reduce and prevent the introduction and dispersal of weeds in the BLM Rock Springs District. Development of effective management practices requires the incorporation of weed management concepts into all phases of land-use planning, such as:

> Documentation of the existence of weed species in the BLM inventory system. This would include species identification, acreage calculations and map locations.
>
> Allotment management plans (AMP) developed with weed management concepts incorporated. For example, where severe weed infestations exist in a watershed characterized by severe erosion, grazing could be excluded until the weed problem is eliminated or under control and the watershed stabilized.
>
> General weed management concepts incorporated into all future resource management plans (RMP).

General Stipulations: The BLM can require that livestock operators and oil, gas and other mineral developers obtaining licenses on Federal land, monitor the land for weed infestations. Specific monitoring requirements, such as seasonal inspection of wildlife and livestock watering ponds, loading and unloading points, livestock drive trails and newly explored or developed land, could be established by the BLM and incorporated into the requirements in leases or licenses that are obtained by operators and developers.

Grazing Management Techniques: Most broad-leaved herbaceous weed infestations on BLM land are closely associated with disturbances such as

land overgrazed by wildlife and livestock, energy exploration and development sites and rights of way. Wildlife and livestock overgrazing weakens the existing vegetational community leaving an avenue for weed infiltration.

For the direct weed control efforts proposed to be most effective and long lasting, on land where grazing programs are established, the timing of the herbicide application with the grazing program is important. Coordination of grazing and treatment programs developed by BLM district managers would afford the best results from direct weed control efforts.

Optimum results of weed control efforts will occur where there is the greatest period of rest between the time of herbicide application and re-use of the land for livestock and wildlife grazing. Herbicide application on grazed land would be as follows:

This has to be Re-worded

Where rest rotation grazing systems are the current or proposed grazing management systems, herbicide application would occur during one of two use periods of the program. Chemical control efforts would either be implemented on the pasture that is in the season-long rest period or, on the pasture that is grazed until seedripe and followed the next year by a season-long rest period. An example of a proposed weed control area managed by a rest rotation grazing system is the Willow Creek allotment in the Kemmerer Resource rotation system and weed control efforts are proposed in pasture #3 of the allotment. Season long rest for pasture #3 would be in 1981 (if the schedule continues as the 1976-1979 schedule). Therefore, weed control efforts would be conducted in 1981.

Where deferred grazing systems are utilized, timing of herbicide applications would again be scheduled to precede the greatest period of rest from grazing.

Where there is some flexibility in the grazing management plans or where management plans are in the updating or development process (AMP), season-long rest periods would be designated in areas where severe designated noxious weed infestations exist. Coordinated weed control

efforts and rehabilitation techniques could then be implemented during the rest season. AMP areas are mainly in the Pinedale and Big Sandy Resource areas.

Where severe designated noxious weed infestations exist, particularly in environmentally sensitive areas, such as along part of the Big Sandy River and Dempsey Creek, livestock would be excluded for no less than one year (See Table 9 and Figure 3 for livestock exclusion areas). County weed and pest supervisors shall coordinate weed control efforts in these areas with the resource area managers.

The county weed and pest supervisors would meet with the BLM before herbicide application to review the existing AMP or other grazing systems that are presently established in areas where weed control is proposed. Those meetings will help assure coordination of herbicide application and grazing management efforts.

Monitoring: Monitoring of weed control efforts under the various management techniques is essential. It is important to know the effectiveness of the control efforts and the data generated will help refine future grazing management-herbicide control programs.

Monitoring programs to be developed will include general observation areas where before and after photographs will be taken of weed control sites under various grazing systems and in environmentally sensitive areas. Monitoring areas and schedules will be developed by BLM resource area specialties. These areas may coincide with existing grazing study areas. The county weed and pest supervisors will be responsible for taking the "before" photographs. The BLM will take the "after" photographs.

Monitoring efforts will include intensive research areas to determine the effectiveness of the direct weed control efforts under various grazing pressures. Study exclosures for other BLM programs are established along the lower Big Sandy River in Sweetwater County and Fish Creek in Sublette County. Grazing management/weed control studies will be set up in these study enclosures. A research program on the lower Big Sandy River will

be conducted cooperatively by the Sweetwater County Weed and Pest Supervisor, the University of Wyoming and the BLM Rock Springs District. A research program will be conducted in the Fish Creek clear cut enclosure by the Sublette County Weed and Pest Supervisor and the BLM Pinedale Resource Area personnel.

Land Reclamation Management Techniques: Certain management techniques can be identified for oil and natural gas pipelines and other right-of-way programs which would prevent the introduction and dispersal of designated noxious weed problems. The management techniques which are to be implemented are as follows:

1. An additional regulation imposed on the existing right-of-way land reclamation reseeding operations, such that seed mixtures to be used in all reseeding rehabilitation programs will be with 90% pure live seed that is certified seed.

2. Mulch, such as native hay, hay of introduced grass and small grain straw that is to be used on all disturbed land, is to be weed propagule (i.e. seed) free. Inspection of mulch may be necessary.

3. Authorized BLM officers who evaluate growth of rehabilitation reseeding operations should also evaluate reseeded areas for the presence of designated noxious and declared weed species. Weed infestation that are identified are to be controlled by the licensee.

Special Area Management Techniques: Environmentally sensitive areas, such as rare trout species habitat, critical watersheds with severe erosion and unstable streambanks, endangered or threatened plant species sitings, and special habitat improvement program areas, have been identified in the Rock Springs District. These areas have been given special consideration in developing weed control techniques to minimize impacts, and rehabilitation measures to enhance the existing environment. The special control measures are listed below according to the environmental concern. The special management areas are also shown in Fig. 3.

Colorado Cutthroat Trout Habitat (Fig. 2): Colorado cutthroat trout are Wyoming state classified rare trout species. This species has been identified in six streams where weed control efforts have been proposed (Table 8). In order to minimize the potential direct toxicological effects to this species from any herbicide use and to minimize non-target vegetation loss, the use of the hand wick applicator will be used in these drainages. Herbicide application will only be conducted from July 15 to October 15 in order to avoid the early growth stages of the Colorado cutthroat trout and other trout species (See Table). A water quality monitoring program will be established in Horse Creek and Muddy Creek for mitigative and documentary purposes. The Wyoming Department of Agriculture will submit a water quality monitoring plan to the Rock Springs District manager before initiation of the program. If concentrations of the herbicides are attained, that are dangerous to the propagation of the Colorado cutthroat trout or any other trout species, herbicide application operations will be discontinued until clearance is given from the BLM district manager.

Unstable Watersheds: Riparian areas that exhibit severe erosion and/or critical channel instability have been identified and designated in Fig. 2 and Table 9. In these sensitive areas reseeding with native grass, where necessary, will follow weed control efforts. Reseeding operations will be carried out by the BLM. Areas having extreme streambank erosion will be reshaped, reseeded and fertilized. BLM personnel will designate areas of reshaping, seeding and fertilization.

Wildlife and livestock will be excluded at least one, and possibly two or more years in specified treatment areas having unstable watersheds and severe weed infestations (Table 9). Exclusion fences will be built by the

Table 8. Colorado River Cutthroat trout habitat with corresponding affected weed infestations.

County	River	Quadrangle	Survey Number	Weed Species	Legal Description	Acres
Sublette	Muddy Creek	Budd Reservoir	005	Canada thistle	T32NR112W Sec. 21,22	5.000
				Canada thistle	T32NR112W Sec. 22	.500
		Onion Springs	005	Canada thistle	T32NR112W Sec. 21	1.000
Sublette	Pine Grove Creek	Pine Grove Ridge	020	Canada thistle	T28NR114W Sec. 9	.060
			021	Canada thistle	T28NR114W Sec. 10	.300
			081	Canada thistle	T28NR114W Sec. 9,10	.120
				Musk thistle	T28NR114W Sec. 10	.006
Sublette	Fogarty Creek	Pine Grove Ridge	078	Canada thistle	T28NR114W Sec. 21,22	1.500
		Cretaceous Mountain	013	Canada thistle	T28NR113W Sec. 19	.060
Sublette	Black Canyon Creek	Pine Grove Ridge	075	Canada thistle	T28NR114W Sec. 28	.006
Sublette	Dry Piney Creek	The Hogsback	046	Canada thistle	T27NR114W Sec. 13	.006
			048	Canada thistle	T27NR114W Sec. 1	.060
			077	Canada thistle	T27NR114W Sec. 13	.030
			108	Hoary cress	T28NR113W Sec. 32	.060
Uinta	Horse Creek	Meeks Cabin Reservoir	081	Canada thistle	T13NR116W Sec. 18	25.000
			085	Canada thistle	T13NR116W Sec. 30	4.500
			049	Canada thistle	T12NR117W Sec. 12	4.500

Table 9. Unstable watersheds with corresponding affected weed infestations.

County	River	Quadrangle	Survey Number	Weed Species	Legal Description	Acres
Lincoln	West Beaver Creek	Sublette Canyon	002	Canada thistle	T24NR118W Sec. 2	<1.000
				Musk thistle	T24NR118W Sec. 2	<1.000
		Wilkinson Creek	008	Canada thistle	T24NR117W Sec. 6,7,8	<3.000
				Musk thistle	T24NR117W Sec. 6,7,8	<3.000
Lincoln	Wilkinson Creek	Wilkinson Creek	009	Canada thistle	T24NR117W Sec. 16,17	<3.000
				Musk thistle	T24NR117W Sec. 16,17	<3.000
Lincoln	Dempsey Creek[1]	Wilkinson Creek	011	Canada thistle	T24NR117W Sec. 29,30,33	<16.000
				Musk thistle	T24NR117W Sec. 29,30,33	<12.000
				Hoary cress	T24NR117W Sec. 29,30,33	<3.000
Sublette	Pine Grove Creek	Pine Grove Ridge	020	Canada thistle	T28NR114W Sec. 9	.060
			021	Canada thistle	T28NR114W Sec. 10	.300
			081	Canada thistle	T28NR114W Sec. 9,10	.120
				Musk thistle	T28NR114W Sec. 10	.006
Sweetwater	Big Sandy River[1]	Pittman Well	043	Perennial pepperweed	T23NR108W Sec. 24	50.000
			044	Perennial pepperweed	T23NR108W Sec. 25	25.000
			045	Perennial pepperweed	T23NR108W Sec. 26	17.000
			034	Perennial pepperweed	T23NR108W Sec. 33	2.500
Sweetwater	Jack Morrow Creek	Essex Mountain	051	Perennial pepperweed	T25NR103W Sec. 17,18 T25NR104W Sec. 2,3,4, 11,12 T26NR104W Sec. 32,33	5.000
Sweetwater	Killpecker Creek	Boars Tusk	048	Perennial pepperweed	T21NR105W Sec. 24	1.000
					T21NR105W Sec. 36	.500
		Reliance	047	Perennial pepperweed	T20NR105W Sec. 10	1.000
					T20NR105W Sec. 22	.500
					T20NR105W Sec. 26	1.500
					T19NR105W Sec. 2	.500

[1] Livestock and big game wildlife are to be excluded from the treatment area along this stream.

BLM on these treatment sites if necessary.

Threatened and Endangered Plant Species: Two proposed threatened plant species sitings are located near weed control sites in Uinta County (Fig. 2 and Table 10). Before weed control operations begin in these areas, the BLM will make a field check for the threatened plant species and provide the information to the county weed and pest supervisor. If any threatened plants are identified close to or within an existing weed infestation the BLM will determine which weed control method should be used. The weed infestation will either be controlled by a physical control method such as hand grubbing or by a chemical control method, using a wick applicator.

Table 10. Threatened and endangered plant species near weed control sites.

Plant Species	County	Quadrangle	Legal Description	Weed Species (Survey No.)	Acres
Physaria condensata	Uinta	Fort Bridger, Wyoming	T16NR116W Sec. 35,36 T16NR115W Sec. 29,30	Canada thistle (107) (111)	6 2
Stanleya pinnata	Uinta	Fort Bridger, Wyoming	T16NR115W Sec. 19,31 T15NR116W Sec. 1	Canada thistle (107) (111)	6 2

Special habitat improvement program areas: Two special habitat improvement programs are presently in operation where weed control efforts are proposed (Fig. 2 and Table 11). They are the lower Big Sandy Wildlife habitat and Stream Improvement Program in Sweetwater County and East Front Aquatic Habitat Management Program in Sublette County. Each program in part is designed to improve, develop and maintain riparian habitat. Herbicide

application in these two habitat improvement areas, excluding the research study areas, is to be restricted to the selective wipe application method.

Table 11. Special habitat improvement program areas with corresponding affected weed infestations.

County	River	Quadrangle	Weed Species (Survey No.)	Acres
Sublette	Pine Grove Creek (T28NR114W Sec. 9, 10,11)	Pine Grove Ridge	Canada thistle (020)	.060
			Canada thistle (021)	.300
			Canada thistle (081)	.120
			Musk thistle (081)	.006
Sweetwater	Big Sandy River (T24NR107W Sec. 11, 14,15,22)	Farson	Perennial pepperweed (020)	5.000
		Simpson Gulch SE	Perennial pepperweed (018)	4.250
			Perennial pepperweed (013)	7.000
			Perennial pepperweed (015)	9.750
			Perennial pepperweed (022)	5.000

All weed control operations proposed for the Rock Springs District are to be monitored by BLM personnel who shall be ~~are~~ certified within two years of program approval, in compliance with the Wyoming Environmental Pest Control Act.

Cost Sharing: Weed control imposes economic responsibilities that can be shared. Implementation of an IPM program can involve the use of legislation for cost-sharing at federal, state, municipal and private levels. Cooperative programs can be developed to enhance the effectiveness of weed control efforts and reduce the cost to all landowners.

Education: Execution of a well-organized educational program would facilitate management techniques. The Wyoming Extension Service, in cooperation with the BLM, County Weed and Pest Supervisors, and the Wyoming Department of Agriculture, would administer educational efforts. These

efforts would include the use of pamphlets, public workshops, and distribution of the accepted weed management decision record to affected livestock operators, energy and development concerns and state and federal agencies.

NO ACTION ALTERNATIVE

The no action alternative allows no control efforts to be implemented to stop the growth and further spread of noxious weeds.

LITERATURE CITED

1. Wyoming Department of Agriculture. 1973. Wyoming Weed and Pest Control Act of 1973. Cheyenne, Wyoming. 9pp.

2. National Academy of Science. 1968. Principles of plant and animal pest control. Vol. 2; Weed Control. Washington, D.C. 471pp.

3. Personal Communication. April 1980. Jesse Hurd, Lincoln County Weed and Pest Supervisor, Afton, Wyoming; Leslie Burrough, Sublette County Weed and Pest Supervisor, Pinedale, Wyoming; Ralph Simnacher, Sweetwater County Weed and Pest Supervisor, Farson, Wyoming; Neal Tuft, Uinta County Weed and Pest Supervisor, Evanston, Wyoming.

4. Written Communication. June 18, 1980. Dr. Paul Dunn, Research Entomologist, U.S.D.A., SEA Biological Control of Weeds Laboratory, Albany, California.

5. Rees, N.E. 1977. Impact of Rhinocyllus conicus[1] on Thistle in Southwestern Montana[2]. Environmental Entomology 6: 839-842.

6. Kok, L.T., and W.W. Surles. 1975. Successful biocontrol of Musk thistle by an introduced weevil, Rhinocyllus conicus. Environmental Entomology 4: 1025-1027.

7. British Columbia Plant Science Lead Committee. 1977. Proceedings knapweed symposium. Kamloops, British Columbia. 294pp.

APPENDIX 1

GLOSSARY OF TERMS

APPENDIX 1

Glossary of Terms

Acid equivalent -- The theoretical yield of parent acid from an active ingredient.

Acres of Infestation -- The total number of acres of land, which weeds cover, as opposed to an infested acre which could be one weed plant in an acre. See infestation acre.

Action (s) -- A generic term that includes one or a group of policies, practices, projects, etc., for which an Environmental Assessment Record (EAR) is prepared.

Active ingredient -- That part of a chemical compound directly responsible for the control of the specific pest.

Acute Oral LD_{50} -- The dosage required to kill 50% of the test animals when given a single oral dose in toxicity studies. The dose is expressed by the weight of the chemical per unit of body weight such as milligrams of toxicant per kilogram of body weight of the test animal.

Annual -- A plant that completes its life cycle in one year.

Biennial -- A plant that completes its life cycle in two years. In the first year, which is frequently referred to as the rosette stage, the seed germinates and the plant produces leaves and roots and stores food.

Biological control -- Controlling a pest by its natural enemies that may already occur in the area or may be introduced.

Brand name -- The name, number, trade-mark or designation applied to an economic poison of any particular description by the manufacturer, distributor, importer or render.

Broadcast application -- An application of pesticide over the entire area or field rather than only to rows, beds, middle or individual plants.

Broadleaf plants -- Botanically classified as dicotyledons. Plants have two cotyledon leaves in the seedling stage; true leaves are broad and have netlike or reticulate veins.

Buffer zone -- the area between the high water line and a designated point away from the stream bank.

Carrier -- The liquid or solid material added to the active ingredient to facilitate its preparation, storage, shipment or field application.

Community -- All populations (groups of individuals of any one kind of organism) in a given area.

Concentration -- Refers to the amount of active ingredient or acid equivalent in a given weight or volume of a mixture. Recommendations and specifications for concentrations of pesticides are frequently given as pounds per unit volume of mixture.

Control -- Reduction of the pest problem to a point where it does not cause significant economic damage.

Diluent -- Any liquid or solid material used to dilute or carry an active ingredient.

Dissolved solids -- The total amount of dissolved material, organic and inorganic, contained in water or wastes. Excessive dissolved solids make water unpalatable for drinking and unsuitable for industrial uses.

Dormant -- Period of time in which seeds and other plant parts do not grow due to natural causes.

Dose (Rate) -- The terms are the same; however rate is preferred. They refer to the amount of active ingredient applied to a unit area regardless of percentage of chemical in the carrier.

Drift -- The movement of air-borne pesticide particles by air motion or wind away from the intended target area.

Ecosystem -- A unit in which the living and the nonliving environment function together.

Environment -- All that surrounds an organism and interacts with it.

Environmental assessment record (EAR) -- Procedure and format for recording environmental analysis.

Environmental components -- General categories of environmental information: (1) nonliving, (2) living, (3) ecological interrelationships, and (4) human values.

Eradication -- Complete elimination of the pest problem from a designated area.

Foliar application -- Applications of the pesticide to plant foliage.

Follow-up program -- To apply herbicides to a weed infested area lying outside or on the periphery of an area that had originally been treated with a herbicide to eliminate the intended weed species.

Formulation -- A mixture containing the active pesticide, the carrier, diluents and other additives required to make the material ready for application.

Granules -- Pesticide formulation in which the active ingredient is impregnated on small particles of a carrier such as clay or ground corncobs.

Hard water -- Generally defined as water containing 332 ppm of calcium carbonate. Water that contains certain minerals, usually calcium and magnesium sulfates, chlorides, or carbonates, in solution in sufficient amount to cause the curd or precipitate instead of a lather when soap is added. Very hard water may cause precipitates in some pesticide sprays.

Hazard -- The probability that injury or detrimental effects will result if a substance is not used properly.

Herbaceous plant -- A vascular plant that remains soft or succulent and does not develop woody tissue.

High volume sprays -- Spray applications of more than 60 gallons per acre volume.

High-water line -- Generally, the maximum level a stream will reach during the spring run-off period.

Human environment -- That which surrounds and affects man.

Impact -- The results of an action on the environment; the impacts may be primary (direct) or secondary (indirect).

Infestation acre -- One designated (noxious) weed plant per acre constitutes an infested acre.

Inert ingredient -- That part of a compound without toxic or killing properties sometimes called the carrier.

Inner streambank -- That part of the streambank that is between the year's obvious high-water line and the water level at the time of observation.

Interdisciplinary team approach -- A group of specialists representing different disciplines working together to identify, discuss, and learn more about the various aspects of a common issue or problem; as distinguished from a multi-disciplinary approach where team members represent their individual disciplines, without participating in group discussion and analysis and where documentation is simply an aggregation of the individual inputs.

Knapsack sprayer (backpack) -- A light sprayer constructed to fit the back or be carried by the operator.

Label -- All written, printed or graphic matter on or attached to pesticide containers as required by law.

LC_{50} -- The concentration of a toxicant which is lethal (fatal) to 50 percent of the organisms tested under the test conditions in a specified time. LC_{50} values are used in inhalation studies and in many toxicity experiments with fish and other wildlife.

LD_{50} -- The dose of a toxicant that is lethal (fatal) to 50 percent of the organisms tested under the test conditions in a specified time. A dose is the quantity actually administered which is the amount of toxicant in a unit of test medium rather than the amount ingested by or administered to the organism.

Liter (l) -- The volume occupied by 1 kilogram of water at a pressure of 760 mm of mercury and a temperature of 4°C. A leter is 1.0567 quart.

Low volume spray -- A spray application of 5 to 20 gallons per acre.

Low-water line -- Generally, the lowest level a stream will reach during the late summer and autumn months.

Microgram per kilogram (ug/kg) -- The concentration at which a millionth of a gram (1 microgram) is contained in a mass of 1 kilogram. A kilogram is 2.2046 pounds.

Milligram per kilogram (mg/kg) -- The concentration at which 1 thousandth of a gram (1 milligram) is contained in a mass of 1 kilogram. A gram contains 1,000 milligrams.

Milligram per liter (mg/1) -- The concentration at which 1 milligram (10 3g) is contained in a volume of 1 liter.

Non-riparian zone -- Land not associated with streams or any other natural body of water.

Noxious weed -- A plant defined by law as being especially undesirable, troublesome, or difficult to control.

Overall treatment -- Application uniformly over the entire area.

Part per million (ppm) -- A concentration at which one unit is contained in a total of a million units. Any units may be used (e.g., weight, volume) but in any given application identical units should be used (e.g., grams per million grams or liters per million liters).

Peak flow -- The maximum quantity of water flowing at any one time in a river or stream. Measurement is usually made in cubic feet per second (CFS).

Perennial -- A plant that lives for more than two years.

Phenoxy herbicide -- A family of herbicides with a molecular structure composed of:

(1) An aromatic (benzene) ring;

(2) An oxygen atom substituted for one hydrogen bonded to the ring;

(3) A carboxyl group bonded indirectly to an oxygen atom, separated from the oxygen atom by an aliphatic chain of one or more carbon atoms;

(4) Various constituents of a ring.

Phytotoxic -- Poisonous or injurious to plants.

Primary characteristics -- Aspects of an element that must be known in order to understand the impact of an action. They are often the key indicators of an impact.

Primary contact recreation -- Water in which the human body may be completely submerged with prolonged and intimate contact. Such activities include swimming, water skiing and floating.

psi -- Pounds per square inch.

Rate -- Same as dosage. It is the amount of active ingredient material applied to a unit area regardless of percentage of chemical in the carrier.

Reentry interval -- The length of time between the pesticide applications and reentry into the field.

Registered -- Pesticides that have been approved for certain uses by the Environmental Protection Agency.

Residual -- A compound that persists or continues to have activity against specific forms of plant and animal life.

Resistance -- The degree to which an organism may suppress or retard the injurious effects of a pesticide.

Retreatment program -- To apply herbicides to an area of land, that had previously been treated with a herbicide, to eradicate the intended weed species that was not eliminated with the first application.

Rhizome -- Underground root-like stem that produces roots and leafy shoots.

Riparian habitat -- Riparian habitat is a unique and specialized form of wetland restricted to areas along, adjacent, or contiguous with perennially and intermittently flowing rivers and streams and other bodies of water. It may be considered transitional between true bottomland wetlands and upland terrestrial habitats and, while associated with water courses, riparian habitat may extend inland for considerable distances if water table depths are proper. Riparian vegetative species composition, unlike that of most wetlands, is highly variable and can range from water-loving forms (phreatophytes or hydrophytes), such as sedges, tamerisk, cottonwood and willow, through more traditional terrestrial forms, such as Douglas fir, aspen and juniper. Riparian vegetation along some intermittently flowing streams may not differ in species composition and density from the surrounding vegetation types. For management purposes, riparian habitat is: 1) the onsite vegetation found immediately adjacent and subject to the influences of surface and subsurface water from streams, rivers or standing bodies of water; 2) a unique "zone" of biotic and abiotic conditions providing food, cover, water and living space for specific animals that are dependent upon it.

Secondary contact recreation -- Water with which the human body may come in contact, but normally not to the point of complete submergence. Such activities include wading, fishing, boating and hiking.

Seedling stage -- Early stage of plant growth, technically prior to the development of a root system other than the seed or seminal root.

Selectivity -- A characteristic of some perticides, whereby certain undesirable species are killed while others such as crop plants or beneficial insects are harmed very little, if any.

Sensitivity -- Not capable of withstanding effects of a pesticide.

Species -- A subdivision of a genus. A group of closely related individuals descending from the same stock.

Spot treatment -- The application of a pesticide to a selected individual area.

Stolon -- The above ground runners or slender stems that develop roots, shoots and new plants at the tip or nodes.

Suspension -- A liquid in which very fine solid material is suspended, but not dissolved.

Synergism -- Compounds working together to produce an effect greater than the sum of their individual actions.

Systemic -- Any compound that, when absorbed into one part of an organism, becomes distributed throughout.

Tolerant -- The ability to withstand the effect.

Toxicity -- The degree to which a substance is poisonous.

Translocation -- The movement of a chemical from the point of absorption (plant leaves, stems, or roots) to other leaves, buds or root tips. Translocation also occurs in animals treated with certain pesticides.

Vapor drift -- The movement of pesticide vapors from the area of application to other areas.

Waiting period -- The time interval (hours or days) between application and harvest which will insure conformance with residue tolerances or label directions.

Weed -- A plant out of place or growing where not desired.

Weed control -- The process of limiting weed infestations so that crops can be grown profitably or other operations can be conducted efficiently.

Weed eradication -- The elimination of weeds from an area.

APPENDIX 2

COUNTY WEED AND PEST CONTROL DISTRICTS SURVEYS
TABLES 1-4

Table 1. Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				SUBLETTE CANYON QUADRANGLE (Riparian Zone)						
002	Canada thistle	02	T24NR118W	2,11,12, 13		6.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
002	Musk thistle	14	T24NR118W	2,11,12, 13		4.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
004	Canada thistle	02	T25NR117W	31	SE¼ SW¼	0.5	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
004	Musk thistle	14	T25NR117W	31	SE¼ SW¼	0.5	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
005	Canada thistle	02	T24NR118W	25,26		1.5	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
005	Musk thistle	14	T24NR118W	25,26		2.5	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
					Total Acres	15.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				SUBLETTE CANYON QUADRANGLE (Non-Riparian Zone)						
002	Canada thistle	02	T24NR118W	3,10,11 12,13		6.0	Tordon	I, II or III	June to Sept.	Bud to maturity
002	Musk thistle	14	T24NR118W	3,10,11 12,13		5.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
004	Canada thistle	02	T25NR117W	31	N½ SW¼	1.5	Tordon	I, II or III	June to Sept.	Bud to maturity
004	Musk thistle	14	T25NR117W	31	N½ SW¼	1.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
005	Canada thistle	02	T24NR118W	26	NW¼ SW¼	0.5	Tordon	I, II or III	June to Sept.	Bud to maturity
005	Musk thistle	14	T24NR118W	26	NW¼ SW¼	0.5	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
006	Canada thistle	02	T23NR118W	2	SW¼ NW¼, NW¼ SW¼	2.0	Tordon	I, II or III	June to Sept.	Bud to maturity
006	Musk thistle	14	T23NR118W	2	SW¼ NW¼, NW¼ SW¼	1.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	17.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMPHERER QUADRANGLE (Riparian Zone)						
012	Canada thistle	02	T23NR117W	5,6,7,8 17,18		3.5	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to August	Bud stage
012	Musk thistle	14	T23NR117W	5,6,7,8, 17,18		2.5	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July	Bud stage
									Retreat Aug. to Sept.	Rosette stage in fall
012	Hoary cress	06	T23NR117W	5,6,7,8, 17,18		0.5	2,4-D amine	II	June to July	Early bud stage
013	Canada thistle	02	T23NR117W	19,20,22, 24,25		13.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
013	Musk thistle	14	T23NR117W	19,20,22, 24,25		8.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July	Bud stage
									Retreat Aug. to Sept.	Rosette stage in fall
013	Hoary cress	06	T23NR117W	19,20,22, 24,25		3.0	2,4-D amine	II	June to July	Early bud stage
014	Canada thistle	02	T23NR117W	27,28,29, 30,31,32,33		7.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
					Total Acres	37.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray gun.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMPHERER QUADRANGLE (Riparian Zone) (cont.)						
014	Musk thistle	14	T23NR117W	27,28,29, 30,31,32,33		6.00	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July	Bud stage
									Retreat Aug. to Sept.	Rosette stage in fall
015	Canada thistle	02	T23NR117W	34,35		0.75	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
015	Musk thistle	14	T23NR117W	34,35		0.75	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July	Bud stage
									Retreat Aug. to Sept.	Rosette stage in fall
015	Hoary cress	06	T23NR117W	34,35		0.75	2,4-D amine	II	June to July	Early bud stage
016	Canada thistle	02	T22NR117W	3	SE¼ NE¼	0.25	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
016	Musk thistle	14	T22NR117W	3	SE¼ NE¼	0.25	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July	Bud stage
									Retreat Aug. to Sept.	Rosette stage in fall
					Total Acres	8.75				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1. (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMMERER QUADRANGLE (Riparian Zone) (cont.)						
016	Hoary cress	06	T22NR117W	3	SW¼ NE¼	0.25	2,4-D amine	II	June to July	Early bud stage
017	Canada thistle	02	T22NR116W	8,9	E½ SE¼, SW¼ NW¼	2.00	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
017	Musk thistle	14	T22NR116W	8,9	E½ SE¼, SW¼ NW¼	2.00	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
017	Hoary cress	06	T22NR116W	8,9	E½ SE¼, SW¼ NW¼	2.00	2,4-D amine	II	June to July	Early bud stage
018	Canada thistle	02	T22NR116W	17,19,20, 21		1.00	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
018	Musk thistle	14	T22NR116W	17,19,20, 21		0.50	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
018	Hoary cress	06	T22NR116W	17,19,20, 21		0.50	2,4-D amine	II	June to July	Early bud stage
019	Canada thistle	02	T22NR116W	28,29		2.00	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
					Total Acres	10.25				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1. (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMMERER QUADRANGLE (Riparian Zone) (cont.)						
019	Musk thistle	14	T22NR116W	28,29		1.00	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
019	Hoary cress	06	T22NR116W	28,29		3.00	2,4-D amine	II	June to July	Early bud stage
020	Canada thistle	02	T22NR116W	32,33,34	S½ SE¼, S½ SW¼	1.00	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine Banvel	II or III	June to Aug.	Bud stage
020	Musk thistle	14	T22NR116W	32,33,34	S½ SE¼, S½ SW¼	1.00	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
020	Hoary cress	06	T22NR116W	32,33,34	S½ SE¼, S½ SW¼	1.00	2,4-D amine	II	June to July	Early bud stage
021	Canada thistle	02	T21NR116W	3,5,8, 9,10		1.50	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
					Total Acres	8.50				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1. (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMMERER QUADRANGLE (Riparian Zone) (cont.)						
021	Musk thistle	14	T21NR116W	3,5,8, 9,10		0.75	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
021	Hoary cress	06	T21NR116W	3,5,8, 9,10		0.75	2,4-D amine	II	June to July	Early bud stage
021	Russian knapweed	10	T21NR116W	3,5,8, 9,10		1.50	Tordon or 2,4-D amine	II or III II or III	June to Sept. July	Bud to maturity Bud stage
				KEMMERER QUADRANGLE (Non-Riparian Zone)						
014	Canada thistle	02	T23NR117W	29,30,31 32,33		3.00	Tordon	I, II or III	June to Sept.	Bud to maturity
014	Musk thistle	14	T23NR117W	29,30,31, 32,33		2.00	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
015	Canada thistle	02	T23NR117W	34	SE¼ SW¼	0.25	Tordon	I, II or III	June to Sept.	Bud to maturity
015	Musk thistle	14	T23NR117W	34	SE¼ SW¼	0.25	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	8.50				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1. (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMMERER QUADRANGLE (Non-Riparian) (cont.)						
016	Canada thistle	02	T22NR117W	2,11,13, 14,24		0.75	Tordon	I, II or III	June to Sept.	Bud to maturity
016	Musk thistle	14	T22NR117W	2,11,13, 14,24		0.75	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
016	Hoary cress	06	T22NR117W	2,11,13, 14,24		0.75	2,4-D amine	I or II	June to July	Early bud stage
017	Canada thistle	02	T22NR116W	4,5,6, 7,8,9		4.00	Tordon	I, II or III	June to Sept.	Bud to maturity
017	Musk thistle	14	T22NR116W	4,5,6, 7,8,9		4.00	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
017	Hoary cress	06	T22NR116W	4,5,6, 7,8,9		2.00	2,4-D amine	II	June to July	Early bud stage
018	Canada thistle	02	T22NR116W	17,18,22		1.00	Tordon	I, II or III	June to Sept.	Bud to maturity
018	Musk thistle	14	T22NR116W	17,18,22		0.50	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
018	Hoary cress	06	T22NR116W	17,18,22		0.50	2,4-D amine	II	June to July	Early bud stage
					Total Acres	14.25				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1. (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				KEMMERER QUADRANGLE (Non-Riparian) (cont.)						
019	Canada thistle	02	T22NR116W	29,30		1.00	Tordon	I, II or III	June to Sept.	Bud to maturity
019	Musk thistle	14	T22NR116W	29,30		1.00	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
019	Hoary cress	06	T22NR116W	29,30		2.00	2,4-D amine	II	June to July	Early bud stage
021	Canada thistle	02	T21NR116W	10	E½ SE¼	0.50	Tordon	I, II or III	June to Sept.	Bud to maturity
021	Musk thistle	14	T21NR116W	10	E½ SE¼	0.25	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
021	Hoary cress	06	T21NR116W	10	E½ SE¼	0.25	2,4-D amine	II	June to July	Early bud stage
021	Russian knapweed	10	T21NR116W	10	E½ SE¼	0.50	Tordon	I, II or III	June to Sept.	Bud to maturity
				SAGE QUADRANGLE (Riparian Zone)						
006	Canada thistle	02	T23NR118W	11,12,13		3.00	Tordon, 2,4-D amine Banvel	II or III II	June to Sept. June to Aug.	Bud to maturity Bud stage
					Total Acres	8.50				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				SAGE QUADRANGLE (Riparian Zone) (cont.)						
006	Musk thistle	14	T23NR118W	11,12,13		3.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
007	Canada thistle	02	T23NR118W	24,25,26		7.0	Tordon, 2,4-D amine or Banvel	II or III II or III	June to Sept. June to Aug.	Bud to maturity Bud stage
007	Musk thistle	14	T23NR118W	24,25,26		4.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
				SAGE QUADRANGLE (Non-Riparian Zone)						
006	Canada thistle	02	T23NR118W	2,11,14, 15		8.0	Tordon	I, II or III	June to Sept.	Bud to maturity
006	Musk thistle	14	T23NR118W	2,11,14, 15		4.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
007	Canada thistle	02	T23NR118W	23,26,35		20.0	Tordon	I, II or III	June to Sept.	Bud to maturity
					Total Acres	46.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					SAGE QUADRANGLE (Non-Riparian Zone) (cont.)					
007	Musk thistle	14	T23NR118W	23,26,35		10.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					POLE CREEK QUADRANGLE (Riparian Zone)					
003	Canada thistle	02	T25NR117W	22,24		4.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
003	Musk thistle	14	T25NR117W	22,24		4.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
004	Canada thistle	02	T25NR117W	25,26		0.5	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
004	Musk thistle	14	T25NR117W	25,26		0.5	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
					Total Acres	19.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					POLE CREEK QUADRANGLE (Non-Riparian Zone)					
003	Canada thistle	02	T25NR117W	23,24		6.5	Tordon	I, II or III	June to Sept.	Bud to maturity
003	Musk thistle	14	T25NR117W	23,24		7.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
004	Canada thistle	02	T25NR117W	25	E½ NE¼	1.0	Tordon	I, II or III	June to Sept.	Bud to maturity
004	Musk thistle	14	T25NR117W	25	E½ NE¼	1.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					WILKINSON CREEK QUADRANGLE (Riparian Zone)					
004	Canada thistle	02	T25NR117W	25,26		2.5	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
004	Musk thistle	14	T25NR117W	25,26		2.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
					Total Acres	20.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Appli.	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				WILKINSON CREEK QUADRANGLE (Riparian Zone) (cont.)						
008	Canada thistle	02	T24NR117W	1,2,3,4, 5,6,7,8		3.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
008	Musk thistle	14	T24NR117W	1,2,3,4, 5,6,7,8		3.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
009	Canada thistle	02	T24NR117W	9,12,13, 16,17,18		3.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine	II or III	June to Aug.	Bud stage
009	Musk thistle	14	T24NR117W	9,12,13, 16,17,18		3.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
010	Canada thistle	02	T24NR117W	19,20,21 22,27,28		9.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
					Total Acres	21.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Appli.	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				WILKINSON CREEK QUADRANGLE (Riparian Zone) (cont.)						
010	Musk thistle	14	T24NR117W	19,20,21 22,27,28		12.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
011	Canada thistle	02	T24NR117W	29,30,31, 32,33,34		16.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
011	Musk thistle	14	T24NR117W	29,30,31, 32,33,34		12.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
011	Hoary cress	06	T24NR117W	29,30,31, 32,33,34		3.0	2,4-D amine	II	June to July	Early bud stage
012	Canada thistle	02	T23NR117W	3,5,6		1.0	Tordon,	II or III	June to Sept.	Bud to maturity
							2,4-D amine or Banvel	II or III	June to Aug.	Bud stage
012	Musk thistle	14	T23NR117W	3,5,6		1.0	Tordon,	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
							2,4-D amine or Banvel	II or III	June to July Retreat Aug. to Sept.	Bud stage Rosette stage in fall
					Total Acres	45.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Appli.	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				WILKINSON CREEK QUADRANGLE (Riparian Zone) (cont.)						
012	Hoary cress	06	T23NR117W	3,5,6		0.2	2,4-D amine	II	June to July	Early bud stage
				WILKINSON CREEK QUADRANGLE (Non-Riparian Zone)						
004	Canada thistle	02	T25NR117W	25,35		4.0	Tordon	I, II or III	June to Sept.	Bud to maturity
004	Musk thistle	14	T25NR117W	25,35		3.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
010	Canada thistle	02	T24NR117W	27,28		1.0	Tordon	I, II or III	June to Sept.	Bud to maturity
010	Musk thistle	14	T24NR117W	27,28		1.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
012	Canada thistle	02	T23NR117W	5,6		1.5	Tordon	I, II or III	June to Sept.	Bud to maturity
012	Musk thistle	14	T23NR117W	5,6		1.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
012	Hoary cress	06	T23NR117W	5,6		0.3	2,4-D amine	II	June to July	Early bud stage
					Total Acres	12.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 1 (cont.). Lincoln County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				NUGENT PARK QUADRANGLE (Non-Riparian Zone)						
001	Canada thistle	02	T25NR117W	18,19		9.0	Tordon	I, II or III	June to Sept.	Bud to maturity
001	Musk thistle	14	T25NR117W	18,19		7.0	Tordon	I, II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres for County	307.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2. Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					TABERNACLE BUTTE QUADRANGLE (Riparian Zone)					
005	Canada thistle	02	T28NR106W	3	SW¼ SW¼	1.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
005	Canada thistle	02	T28NR106W	3	NE¼ SE¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
006	Canada thistle	02	T28NR106W	9	SW¼ NW¼	.030	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
009	Canada thistle	02	T28NR106W	23	NE¼ SE¼	.030	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					LECKIE RESERVOIR QUADRANGLE (Riparian Zone)					
004	Canada thistle	02	T29NR105W	24	SE¼ NW¼	.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
008	Canada thistle	02	T28NR104W	19,20	SE¼ NE¼	2.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					BULL DRAW QUADRANGLE (Riparian Zone)					
011	Canada thistle	02	T28NR107W	3		.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					Total Acres	4.072				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					PARTING OF THE WAYS QUADRANGLE (Riparian Zone)					
001	Canada thistle	02	T28NR104W	21	NE¼ SW¼	.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					MEADOW CANYON NE QUADRANGLE (Riparian Zone)					
001	Canada thistle	02	T32NR113W	28	SW¼ NW¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
002	Canada thistle	02	T32NR113W	27	NE¼ NE¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
006	Canada thistle	02	T31NR113W	4	NW¼ NW¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
012	Canada thistle	02	T31NR113W	10	NW¼ NW¼	.018	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					MEADOW CANYON NE QUADRANGLE (Non-Riparian Zone)					
007	Musk thistle	14	T31NR113W	11	NW¼	.006	Tordon and 2,4-D Tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					DONIEL QUADRANGLE (Riparian Zone)					
203	Canada thistle	02	T33NR111W	24	SE¼ NE¼	.090	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					Total Acres	.638				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					ONION SPRINGS QUADRANGLE (Riparian Zone)					
005	Canada thistle	02	T32N81112W	21	NE¼	1.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					BUDD RESERVOIR QUADRANGLE (Riparian Zone)					
003	Canada thistle	02	T32NR112W	19	NW¼ SW¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
004	Canada thistle	02	T32NR113W	25	NW¼ SE¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
005	Canada thistle	02	T32NR112W	21 22	E½ NE¼ SW¼ NW¼	2.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
005	Canada thistle	02	T32NR112W	22	SE¼ SE¼	.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					BUDD RESERVOIR QUADRANGLE (Non-Riparian Zone)					
009	Hoary cress	06	T31NR112W	20,21	SE¼ NE¼, SW¼ NW¼, SW¼ SE¼	.500	2,4-D Amine	I and/or II	May to July	Early bud stage
					BALL ISLAND QUADRANGLE (Riparian Zone)					
013	Canada thistle	02	T31NR111W	4	SE¼ NW¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					Total Acres	4.030				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					BALL ISLAND QUADRANGLE (Riparian Zone) (cont.)					
013	Canada thistle	02	T31NR111W	3,4,5,8 9,10		5.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud stage
013	Canada thistle	02	T31NR111W	3,4,5,10		5.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					PINE GROVE RIDGE QUADRANGLE (Riparian Zone)					
020	Canada thistle	02	T28NR114W	9	NE¼ NE¼	.060	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
021	Canada thistle	02	T28NR114W	10	NW¼ NW¼	.300	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
075	Canada thistle	02	T28NR114W	28	SW¼ SE¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
078	Canada thistle	02	T28NR114W	15,21,22		1.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
081	Canada thistle	02	T28NR114W	9,10		.120	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
081	Musk thistle	14	T28NR114W	10	NE¼ NW¼	.006	Banvel 4WS or Banvel Beads	II or III	June or Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	11.992				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					PINE GROVE RIDGE QUADRANGLE (Non-Riparian Zone)					
036	Plumeless thistle	16	T29NR114W	25	SW¼ NW¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
044	Canada thistle	02	T28NR114W	29	NE¼ SE¼	.066	Tordon and 2,4-D tank mix	I and/or II	July to Sept.	Bud to maturity
044	Musk thistle	14	T28NR114W	29	NE¼ SE¼	.012	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					CHIMNEY BUTTE QUADRANGLE (Riparian Zone)					
037	Canada thistle	02	T29NR112W	22	SW¼ SE¼ NW¼	.054	Banvel 4WS or Banvel Bead	II or III	July or Sept.-Oct.	Early bud or maturity
100	Hoary cress	06	T29NR112W	34	NW¼ SE¼	.078	2,4-D Amine	II	May to July	Early bud stage
101	Musk thistle	14	T29NR112W	33	SW¼ SE¼	.006	Banvel 4WS or Banvel Beads	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
120	Canada thistle	02	T29NR112W	30	SE¼ SW¼	.186	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
120	Musk thistle	14	T29NR112W	30	SE¼ SW¼	.006	Banvel 4WS or Banvel Beads	II or III	June or Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	.414				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					CHIMNEY BUTTE QUADRANGLE (Riparian Zone) (cont.)					
121	Canada thistle	02	T29NR112W	33	SE¼ NW¼	.024	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					CHIMNEY BUTTE QUADRANGLE (Non-Riparian Zone)					
110	Hoary cress	06	T29NR112W	27	SE¼ NE¼	.043	2,4-D amine	I and/or II	May to July	Early bud stage
118	Canada thistle	02	T29NR112W	20	NE¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					MELLESON DRAW QUADRANGLE (Non-Riparian Zone)					
111	Hoary cress	06	T28NR112W	14	SE¼ NW¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
					LAKE MOUNTAIN QUADRANGLE (Riparian Zone)					
114	Canada thistle	02	T28NR114W	34	SE¼ NW¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					LAKE MOUNTAIN QUADRANGLE (Non-Riparian Zone)					
016	Musk thistle	14	T27NR114W	3	NW¼ NW¼	.300	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	.391				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					THE HOGSBACK QUADRANGLE (Riparian Zone)					
046	Canada thistle	02	T27NR114W	13	NE¼ SW¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
048	Canada thistle	02	T27NR114W	1	SE¼ SE¼	.060	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
077	Canada thistle	02	T27NR114W	13	NW¼ NW¼	.060	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
077	Canada thistle	02	T27NR114W	13	NE¼ NW¼	.030	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
108	Hoary cress	06	T28NR113W	32	NE¼ SE¼	.060	2,4-D amine	II	May to July	Early bud stage
209	Hoary cress	06	T27NR113W	17	E½ NE¼	.006	2,4-D amine	II	May to July	Early bud stage
210	Canada thistle	02	T27NR113W	19	SE¼ SE¼	.012	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
210	Hoary cress	06	T27NR113W	20	NE¼ SE¼	.072	2,4-D amine	II	May to July	Early bud stage
					THE HOGSBACK QUADRANGLE (Non-Riparian Zone)					
014	Musk thistle	14	T27NR114W	1	SE¼ SW¼	.120	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	.426				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					THE HOGSBACK QUADRANGLE (Non-Riparian Zone) (cont.)					
014	Canada thistle	02	T27NR114W	1	SE¼ SW¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
052	Canada thistle	02	T27NR113W	15	SW¼ NE¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
113	Canada thistle	02	T27NR114W	2	SW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
129	Hoary cress	06	T28NR113W	34		.030	2,4-D amine	I and/or II	May to July	Early bud stage
129	Hoary cress	06	T28NR113W	34	SW¼ SW¼	.012	2,4-D amine	I and/or II	May to July	Early bud stage
129	Hoary cress	06	T28NR113W	33	SE¼ SE¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
208	Leafy spurge	03	T27NR113W	15	NW¼ NW¼	.006	Tordon 22K	I and/or II	June to Sept.	Bud to maturity
209	Hoary cress	06	T27NR113W	8	NW¼ SW¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
209	Hoary cress	06	T27NR113W	7	SE¼ SE¼	.018	2,4-D amine	I and/or II	May to July	Early bud stage
209	Canada thistle	02	T27NR113W	7	NE¼ SE¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					Total Acres	.156				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					THE HOGSBACK QUADRANGLE (Non-Riparian Zone) (cont.)					
209	Hoary cress	06	T27NR113W	7	NE¼ SE¼	.036	2,4-D amine	I and/or II	May to July	Early bud stage
209	Canada thistle	02	T27NR113W	19		.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
209	Hoary cress	06	T27NR113W	19	NW¼ NE¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
210	Hoary cress	06	T27NR113W	19	SW¼ SE¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
215	Leafy spurge	03	T27NR113W	24	NW¼ NW¼	5.000	Tordon 22K	I and/or II	June to Sept.	Bud to maturity
					BIG PINEY WEST QUADRANGLE (Riparian Zone)					
014	Canada thistle	02	T30NR112W	8	SW¼ SW¼	.108	Banvel 4WS or Banvel Beads	II or III	July to Sept.- Oct.	Early bud or maturity
014	Canada thistle	02	T30NR112W	17	NW¼ NE¼	.012	Banvel 4WS or Banvel Beads	II or III	July to Sept.- Oct.	Early bud or maturity
					BIG PINEY WEST QUADRANGLE (Non-Riparian Zone)					
059	Plumeless thistle	16	T30NR112W	18	SE¼ NE¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	5.180				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					BIG PINEY WEST QUADRANGLE (Non-Riparian Zone) (cont.)					
059	Canada thistle	02	T30NR112W	18	SW¼ NW¼	.012	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
064	Canada thistle	02	T30NR113W	13	SE¼ NE¼	.012	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					MEADOW CANYON SE QUADRANGLE (Riparian Zone)					
004	Canada thistle	02	T30NR113W	9	NW¼ NE¼	.012	Banvel 4WS or Banvel Beads	II or III	July to Sept.- Oct.	Early bud or maturity
030	Plumeless thistle	16	T30NR113W	5	NW¼ SE¼	.006	Banvel 4WS or Banvel Beads	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
030	Musk thistle	14	T30NR113W	5	NW¼ SE¼	.006	Banvel 4WS or Banvel Beads	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
032	Canada thistle	02	T30NR113W	20	NE¼ NE¼	.500	Banvel 4WS or Banvel Beads	II or III	July to Sept.- Oct.	Early bud or maturity
033	Canada thistle	02	T30NR113W	21	SE¼ NW¼	.054	Banvel 4WS or Banvel Beads	II or III	July to Sept.- Oct.	Early bud or maturity
033	Plumeless thistle	16	T30NR113W	21	SE¼ NW¼	.006	Banvel 4WS or Banvel Beads	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	.608				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEADOW CANYON SE QUADRANGLE (Riparian Zone) (cont.)					
033	Musk thistle	14	T30NR113W	21	SE¼ NW¼	.012	Banvel 4WS or Banvel Beads	II or III	June or Sept.	Rosette stage or before flowering stalk lengthens
054	Canada thistle	02	T30NR113W	12	W½ E½ E½	1.250	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
055	Canada thistle	02	T30NR113W	11,12,14		1.000	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
055	Musk thistle	14	T30NR113W	11,12,14	NW¼ SW¼	.500	Banvel 4WS or Banvel Beads	II or III	June or Sept.	Rosette stage or before flowering stalk lengthens
061	Canada thistle	02	T30NR113W	24	NW¼ NW¼	.024	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
063	Canada thistle	02	T30NR113W	13	NW¼ NW¼	.500	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
063	Musk thistle	14	T30NR113W	13	NW¼ NW¼	.500	Banvel 4WS or Banvel Beads	II or III	June or Sept.	Rosette stage or before flowering stalk lengthens
065	Canada thistle	02	T29NR113W	7	S½	.100	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					Total Acres	3.886				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEADOW CANYON SE QUADRANGLE (Riparian Zone) (cont.)					
072	Canada thistle	02	T30NR113W	16	SE¼ NW¼	.060	Banvel 4WS or Banvel Beads	II or III	July to Sept.-Oct.	Early bud or maturity
097	Canada thistle	02	T31NR113W	31	SE¼ SE¼	.108	Banvel 4WS or Banvel Beads	II or III	July to Sept.-Oct.	Early bud or maturity
					MEADOW CANYON SE QUADRANGLE (Non-Riparian Zone)					
031	Plumeless thistle	16	T30NR113W	9	NW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
040	Canada thistle	02	T29NR113W	18	SW¼ NE¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
056	Canada thistle	02	T30NR113W	2	NW¼ NW¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
058	Canada thistle	02	T30NR113W	13	SW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
058	Musk thistle	14	T30NR113W	13	SW¼ SW¼	.066	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
067	Musk thistle	14	T30NR113W	35	SE¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	.204				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEADOW CANYON SW QUADRANGLE (Non-Riparian Zone)					
085	Canada thistle	02	T29NR114W	5	N½	1.000	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
085	Canada thistle	02	T29NR114W	4	SW¼	.010	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					LA BARGE QUADRANGLE (Riparian Zone)					
053	Canada thistle	02	T28NR113W	35	SW¼ SE¼	.018	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
204	Hoary cress	06	T27NR113W	12	NW¼ SW¼	.012	2,4-D amine	II	May to July	Early bud stage
205	Leafy spurge	03	T27NR113W	14	NE¼ NW¼	.006	Banvel 4WS or Banvel Beads	II or III	June or July Follow-up, Sept.-Oct.	Early bud or maturity
214	Leafy spurge	03	T27NR113W	27	SE¼ NE¼	.250	Banvel 4WS or Banvel Beads	II or III	June or July Follow-up, Sept.-Oct.	Early bud or maturity
216	Leafy spurge	03	T27NR113W	15	SE¼ SE¼	5.000	Banvel 4WS or Banvel Beads	II or III	June or July Follow-up, Sept.-Oct.	Early bud or maturity
216	Leafy spurge	03	T27NR113W	7	SW¼ SW¼	5.000	Banvel 4WS or Banvel Beads	II or III	June or July Follow-up, Sept.-Oct.	Early bud or maturity
					LA BARGE QUADRANGLE (Non-Riparian Zone)					
127	Hoary cress	06	T28NR112W	27	SW¼ SW¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
					Total Acres	11.302				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEADOW CANYON SE QUADRANGLE (Non-Riparian Zone) (cont.)					
067	Canada thistle	02	T30NR113W	2	W½	.360	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
067	Hoary cress	06	T29NR113W	2	SW¼	.300	2,4-D amine	I and/or II	May to July	Early bud stage
067	Musk thistle	14	T29NR113W	2	W½	.060	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
069	Hoary cress	06	T30NR113W	34	SW¼ SW¼	.060	2,4-D amine	I and/or II	May to July	Early bud stage
071	Musk thistle	14	T30NR113W	28	N½ NW¼	.024	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
071	Canada thistle	02	T30NR113W	28	NW¼ NW¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
073	Canada thistle	02	T30NR113W	15	NW¼ NW¼	.150	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
103	Musk thistle	14	T30NR113W	21	SW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
					Total Acres	1.020				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					LA BARGE QUADRANGLE (Non-Riparian Zone) (cont.)					
128	Hoary cress	06	T28NR112W	29	SE¼ SE¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
206	Canada thistle	02	T27NR113W	11	SW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
207	Canada thistle	02	T27NR113W	10	SE¼ SE¼	.006	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
212	Leafy spurge	03	T27NR113W	26	NW¼ SW¼	.006	Tordon 22K	I and/or II	June to Oct.	Bud to maturity
213	Canada thistle	02	T27NR113W	26	E½ NW¼	.012	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
217	Hoary cress	06	T27NR112W	19	NE¼ SE¼	.006	2,4-D amine	I and/or II	May to July	Early bud stage
					CRETACEOUS MOUNTAIN QUADRANGLE (Riparian Zone)					
039	Canada thistle	02	T29NR113W	22	NW¼	.500	Banvel 4WS or Banvel Beads	II or III	July to Sept.-Oct.	Early bud or maturity
039	Musk thistle	14	T29NR113W	22	NW¼	.018	Banvel 4WS or Banvel Beads	II or III	June to Sept.	Rosette stage or before flowering stalk lengthens
041	Canada thistle	02	T29NR113W	32	NW¼ SE¼	.036	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					Total Acres	.596				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					CRETACEOUS MOUNTAIN QUADRANGLE (Riparian Zone) (cont.)					
043	Canada thistle	02	T28NR113W	30	SE¼ NE¼	.043	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
043	Canada thistle	02	T28NR113W	29	SW¼ NW¼	.049	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
083	Canada thistle	02	T28NR113W	3	SW¼ SW¼	.006	Banvel 4WS or Banvel Beads	II or III	July or Sept.-Oct.	Early bud or maturity
					CRETACEOUS MOUNTAIN QUADRANGLE (Non-Riparian Zone)					
013	Canada thistle	02	T28NR113W	19	NW¼ NW¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
018	Canada thistle	02	T28NR114W	1	NW¼ SE¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
019	Canada thistle	02	T28NR114W	2	NW¼ SE¼	.210	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
022	Canada thistle	02	T28NR114W	24	NE¼ SW¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
023	Canada thistle	02	T29NR113W	33	NW¼ SE¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
023	Canada thistle	02	T29NR113W	33	SW¼ SW¼	.120	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					Total Acres	.668				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					CRETACEOUS MOUNTAIN QUADRANGLE (Non-Riparian Zone) (cont.)					
025	Canada thistle	02	T28NR113W	7	NW¼ NE¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
026	Canada thistle	02	T28NR114W	1	NW¼ NE¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
035	Musk thistle	14	T29NR113W	14	NW¼ SW¼	.006	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
074	Hoary cress	06	T28NR114W	25	SE¼ SE¼	.012	2,4-D amine	I and/or II	May to July	Early bud stage
115	Musk thistle	14	T28NR114W	27	NW¼ SE¼	.078	Tordon and 2,4-D tank mix	I and/or II	June to Sept.	Rosette stage or before flowering stalk lengthens
115	Canada thistle	02	T28NR114W	27	NE¼ SE¼	.018	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
122	Canada thistle	02	T28NR113W	4	SW¼ NW¼	.072	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
123	Canada thistle	02	T29NR113W	33	NE¼ SE¼	.030	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
123	Canada thistle	02	T29NR113W	33	NW¼ SE¼	.012	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to maturity
					Total Acres	.348				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 2 (cont.). Sublette County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					CRETACEOUS MOUNTAIN QUADRANGLE (Non-Riparian Zone) (cont.)					
123	Canada thistle	02	T29NR113W	33	NE¼ SW¼	.060	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to Maturity
124	Canada thistle	02	T28NR114W	1	SW¼ NW¼	.030	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to Maturity
124	Canada thistle	02	T28NR114W	1	NW¼ NW¼	.072	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to Maturity
125	Canada thistle	02	T28NR114W	13	SE¼ NW¼, SW¼ SE¼	.066	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to Maturity
126	Canada thistle	02	T28NR114W	2	SE¼ NW¼	.030	Tordon and 2,4-D tank mix	I and/or II	July to Oct.	Bud to Maturity
					MEADOW CANYON SW QUADRANGLE (Non-Riparian Zone)					
	Canada thistle	02	T30NR114W T29NR114W	31,32 5,6	S½ Whole	50.000	Roundup	II	July to Aug.	Early bud stage
	Musk thistle	14	T30NR114W T29NR114W	31,32 5	S½	.500 5.000	Roundup	II	July to Aug.	Rosette stage or before flowering stalk lengthens
					Total Acres for County	101.689				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom
II - hand sprayers (liquid formulation)
III - hand spreaders (granular application) a. PCB spreaders, b. shakers

Table 3. Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					BIG SANDY RESERVOIR QUADRANGLE (Riparian Zone)					
033	Canada thistle	02	T26NR106W	3	SW¼ NE¼	2.000	Tordon or Banvel	I and/or II or III	June to Sept. June to Sept.	Bud to maturity Rosette or early bud stage
033	Canada thistle	02	T26NR106W	3	NE¼ NW¼	1.000	Tordon or Banvel	I and/or II or III	June to Sept. June to Sept.	Bud to maturity Rosette or early bud stage
033	Canada thistle	02	T26NR106W	3	SE¼	2.500	Tordon or Banvel	I and/or II or III	June to Sept. June to Sept.	Bud to maturity Rosette or early bud stage
012	Canada thistle	02	T27NR106W	22	SE¼ NE¼	.006	Tordon or Banvel	I and/or II or III	June to Sept. June to Sept.	Bud to maturity Rosette or early bud stage
012	Canada thistle	02	T27NR106W	22	SE¼ NE¼	.006	Tordon or Banvel	I and/or II or III	June to Sept. June to Sept.	Bud to maturity Rosette or early bud stage
					PITTMAN WELL QUADRANGLE (Riparian Zone)					
041	Perennial Pepperweed	07	T23NR108W	12	SW¼	15.000	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
042	Perennial Pepperweed	07	T23NR108W	13	SW¼ NE¼	5.000	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
042	Perennial Pepperweed	07	T23NR108W	13	NW¼	27.000	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
042	Perennial Pepperweed	07	T23NR108W	13	SW¼	8.000	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					Total Acres	60.512				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					PITTMAN WELL QUADRANGLE (Riparian Zone)(cont.)					
042	Perennial pepperweed	07	T23NR108W	13	SE¼	15.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
043	Perennial pepperweed	07	T23NR108W	24		50.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
044	Perennial pepperweed	07	T23NR108W	25	NW¼	25.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
045	Perennial pepperweed	07	T23NR108W	26	NE¼	17.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
046	Perennial pepperweed	07	T23NR108W	11	E½	21.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					GASSON BRIDGE QUADRANGLE (Riparian Zone)					
026	Perennial pepperweed	07	T23NR109W	25	NW¼ NE¼	3.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
026	Perennial pepperweed	07	T23NR109W	25	NW¼	14.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
026	Perennial pepperweed	07	T23NR109W	25	SW¼	3.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
027	Perennial pepperweed	07	T23NR109W	26		28.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					Total Acres	176.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PBC spreaders; b. shakers.

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					CASSON BRIDGE QUADRANGLE (Riparian Zone) (cont.)					
028	Perennial pepperweed	07	T23NR109W	26	E½ SE¼	12.5	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
029	Perennial pepperweed	07	T23NR109W	24	SE¼	5.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
034	Perennial pepperweed	07	T23NR108W	33	NW¼ NE¼	2.5	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
035	Perennial pepperweed	07	T23NR108W	19	SW¼	5.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					THOMAN SCHOOL QUADRANGLE (Riparian Zone)					
023	Perennial pepperweed	07	T22NR109W	10	W½	25.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
024	Perennial pepperweed	07	T22NR109W	4	SE¼ SE¼	3.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
025	Perennial pepperweed	07	T22NR109W	3	NW¼	10.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
026	Perennial pepperweed	07	T22NR109W	3	NW¼ SW¼	15.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
028	Perennial pepperweed	07	T23NR109W	27	E½ SE¼	12.5	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					Total Acres	90.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					THOMAN SCHOOL QUADRANGLE (Riparian Zone) (cont.)					
032	Perennial pepperweed	07	T23NR109W	34	NE¼ NE¼	5.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
032	Perennial pepperweed	07	T23NR109W	34	SW¼	36.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					LOMBARD BUTTES QUADRANGLE (Riparian Zone)					
030	Perennial pepperweed	07	T22NR109W	28	NW¼	15.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
030	Perennial pepperweed	07	T22NR109W	28	NE¼ SW¼	2.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					FARSON QUADRANGLE (Riparian Zone)					
001	Perennial pepperweed	07	T24NR107W	12	S½ NE¼, S½ NW¼	55.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
002	Perennial pepperweed	07	T24NR107W	11	NE¼ SE¼	5.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
004	Perennial pepperweed	07	T24NR106W	7	W½ NW¼	30.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
005	Perennial pepperweed	07	T25NR106W	33	N½ SW¼, SE¼ SW¼	20.0	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					Total Acres	168.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					FARSON QUADRANGLE (Riparian Zone) (cont.)					
008	Perennial pepperweed	07	T25NR106W	22	SW¼ SW¼	12.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					SIMPSON GULCH SE QUADRANGLE (Riparian Zone)					
010	Perennial pepperweed	07	T24NR107W	32	NW¼ NE¼	2.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
011	Perennial pepperweed	07	T24NR107W	22	NW¼	5.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
012	Perennial pepperweed	07	T24NR107W	15	NE¼ SE¼, SW¼ SE¼	9.75	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
013	Perennial pepperweed	07	T24NR107W	14	NW¼ NW¼	7.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
014	Perennial pepperweed	07	T24NR107W	29	NW¼ NE¼	1.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
014	Perennial pepperweed	07	T24NR107W	29	SE¼ NW¼	2.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
014	Perennial pepperweed	07	T24NR107W	29	NW¼ SE¼	2.00	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
018	Perennial pepperweed	07	T24NR107W	11	SW¼ SE¼, SE¼ SW¼	4.25	2,4-D amine	I and/or II	July to Sept.	Bud to bloom
					Total Acres	45.00				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a.PCB spreaders; b. shakers.

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					RELIANCE QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T20NR105W	10		1.0	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
				22	NE¼	0.5	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
				26	W½	1.5	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
	Perennial pepperweed	07	T19NR105W	2	SW¼ SW¼	0.5	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
					BOARS TUSK QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T21NR105W	24	NE¼ NE¼	0.5	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
				36	SE¼	1.0	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
					GREEN RIVER QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T18NR107W	24	E½ SE¼	5.0	2,4-D amine	I or II	July to Sept.	Bud to Bloom
	Perennial pepperweed	07	T18NR106W	20	N½	7.0	2,4-D amine	I or II	July to Sept.	Bud to Bloom
					KANDA QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T18NR106W	6	SE¼ SE¼	.5	2,4-D amine	I or II	July to Sept.	Bud to Bloom
				12	SE¼ SE¼	1.5	2,4-D amine	I or II	July to Sept.	Bud to Bloom
				14	N½, N½ SW¼	6.0	2,4-D amine	I or II	July to Sept.	Bud to Bloom
				22	W½	5.0	2,4-D amine	I or II	July to Sept.	Bud to Bloom
					Total Acres	30.0				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular application) a. PCB spreaders; b. shakers.
IV - aerial application (liquid formulation)

Table 3 (cont.). Sweetwater County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				ESSEX MOUNTAIN QUADRANGLE (Riparian Zone)						
	Perennial pepperweed	07	T25NR103W	17,18			2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
	Perennial pepperweed	07	T25NR104W	3,4,11		5.0	2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
				12,13			2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
	Perennial pepperweed	07	T26NR104W	32,33			2,4-D amine	I,II or IV	July to Sept.	Bud to Bloom
				Total Acres for County		575.012				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular application) a. PCS spreaders; b. shakers.

IV - aerial application (liquid formulation)

Table 4. Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					REED RESERVOIR QUADRANGLE (Riparian Zone)					
001	Canada thistle	02	T13NR113W	30	NW¼	5	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
003	Canada thistle	02	T13NR114W	3	E½ SE¼	2	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
004	Canada thistle	02	T14NR114W	36		7	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
005	Canada thistle	02	T13NR114W	2		12	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
006	Canada thistle	02	T14NR113W	31	NW¼	4	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
007	Canada thistle	02	T14NR114W	25		9	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
008	Canada thistle	02	T14NR114W	26	SE¼	3	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
009	Canada thistle	02	T14NR113W	21	NE¼ NW¼	.5	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					Total Acres	42.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4 (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEEKS CABIN RESERVOIR QUADRANGLE (Riparian Zone)					
001	Canada thistle	02	T12NR117W	22		.030	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud to maturity
049	Canada thistle	02	T12NR117W	12		4.500	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud to maturity
050	Canada thistle	02	T13NR116W	28	SW¼	2.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud to maturity
081	Canada thistle	02	T13NR116W	18 18 18	NE¼ NE¼ NW¼ E½ SE¼	5.000 45.000 20.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud to maturity
085	Canada thistle	02	T13NR116W	30 30	SE¼ NW¼ N½ SW¼	2.000 2.500	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud to maturity
					MEEKS CABIN RESERVOIR QUADRANGLE (Non-Riparian)					
010	Canada thistle	02	T13NR117W	12	SE¼ SE¼	.012	Tordon 22K	I	June to Sept.	Bud to maturity
					BUCK FEVER RIDGE QUADRANGLE (Riparian Zone)					
035	Canada thistle	02	T13NR115W	29	SE¼ NE¼	4.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					Total Acres	85.042				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4 (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					FORT BRIDGER QUADRANGLE (Riparian Zone) (cont.)					
111	Canada thistle	02	T16NR116W	34	E½ SE¼	2.00	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					HAGUE CREEK QUADRANGLE (Riparian Zone)					
178	Canada thistle	02	T14NR116W	21	SE¼ SW¼	1.00	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					TABLE MOUNTAIN QUADRANGLE (Riparian Zone)					
073	Canada thistle	02	T13NR114W	17 17	NW¼ NW¼ NE¼	4.50 2.00	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
074	Canada thistle	02	T13NR114W	18 18	SE¼ SW¼ SW¼ SE¼	1.00 2.50	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
075	Canada thistle	02	T13NR114W	19	NW¼	4.00	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					LEAVITT BENCH QUADRANGLE (Riparian Zone)					
148	Canada thistle	02	T14NR114W	19	NE¼ NE¼	1.25	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
149	Canada thistle	02	T14NR115W	24	SE¼	1.50	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					Total Acres	21.75				

[1] I - ground units (liquid formulation) a. hand spray b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4 (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					LEAVITT BENCH QUADRANGLE (Riparian Zone) (cont.)					
150	Canada thistle	02	T14NR115W	34	NW¼ NE¼	1.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
151	Canada thistle	02	T14NR115W	27 27	W½ SW¼ NE¼ NE¼	4.0 2.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
152	Canada thistle	02	T14NR115W	22	SE¼ SE¼	10.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
168	Canada thistle	02	T14NR114W	22	N½ NW¼	2.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
169	Canada thistle	02	T14NR114W	17	S½	5.5	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					CUMBERLAND GAP QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T18NR117W	24	NW¼ NW¼	1.0	2,4-D amine	II or III	May to July	Early bud stage
					BRIDGER QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T18NR117W	34	SE¼ SE¼	8.0	2,4-D amine	II or III	May to July	Early bud stage
	Perennial pepperweed	07	T17NR117W	10 22	E½ E½	15.5 15.5	2,4-D amine 2,4-D amine	II or III II or III	May to July May to July	Early bud stage Early bud stage
					Total Acres	64.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.
II - hand sprayers (liquid formulation)
III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4 (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				BUCK FEVER RIDGE QUADRANGLE (Riparian Zone) (cont.)						
036	Canada thistle	02	T13NR115W	21	SE¼	5.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
037	Canada thistle	02	T13NR115W	28 28 28	SW¼ NE¼ NE¼ SW¼ NW¼ SE¼	2.0 1.0 1.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
041	Canada thistle	02	T13NR116W	23	SE¼ SE¼	2.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
043	Canada thistle	02	T13NR116W	12 12 12	NW¼ NE¼ SE¼ NW¼ NE¼ SW¼	2.0 1.0 4.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
044	Canada thistle	02	T13NR116W	14	W½ NW¼	3.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
045	Canada thistle	02	T13NR116W	11	S½ SW¼	1.5	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
047	Canada thistle	02	T13NR116W	22	NE¼ SW¼	8.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
048	Canada thistle	02	T13NR116W	15	E½	5.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
050	Canada thistle	02	T13NR116W	28	SW¼	1.0	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					Total Acres	16.5				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4 (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
				BUCK FEVER RIDGE QUADRANGLE (Non-Riparian Zone)						
013	Canada thistle	02	T13NR115W	8 17	SE¼ SW¼ SW¼ NE¼	.006 .006	Tordon 22K	I and/or II	June to Sept.	Bud to maturity
				ROBERTSON QUADRANGLE (Riparian Zone)						
043	Canada thistle	02	T13NR116W	12	NW¼ NE¼	2.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
178	Canada thistle	02	T14NR116W	21	SE¼ SW¼	.250	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
				LEROY QUADRANGLE (Riparian Zone)						
064	Canada thistle	02	T15NR16W	9 9	W½ NW¼ N½ SW¼	4.000 2.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
				FORT BRIDGER QUADRANGLE (Riparian Zone)						
064	Canada thistle	02	T15NR116W	9	NE¼ SW¼	1.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
102	Canada thistle	02	T15NR116W	9	N½ NE¼	3.500	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
167	Canada thistle	02	T16NR116W	35 35	NW¼ SE¼ N½ SW¼	2.000 4.000	Tordon or Banvel	II or III	June to Sept. June to Sept.	Bud to maturity Early bud or maturity
					Total Acres	18.762				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

Table 4. (cont.). Uinta County Weed Control Program

Survey No.	Weed Species	Code	Township & Range	Section	Sub-Section	Acres of Infestation	Herbicide Applied	Method[1] of Appli.	Time of Appli.	Phenotypic Stage of Growth
					MEADOW DRAW, WYOMING QUADRANGLE (Riparian Zone)					
	Perennial pepperweed	07	T17NR117W	34	NW¼	10.000	2,4-D amine	II or III	May to July	Early bud stage
					Total Acres for County	279.054				

[1] I - ground units (liquid formulation) a. hand spray gun; b. spray boom.

II - hand sprayers (liquid formulation)

III - hand spreaders (granular applicator) a. PCB spreaders; b. shakers.

APPENDIX 3

COUNTY WEED AND PEST SUPERVISORS

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

APPENDIX 3

COUNTY WEED AND PEST SUPERVISORS

Lincoln County
Mr. Jesse Hurd
Afton, Wyoming 83110

Sublette County
Mr. Leslie Burrough
P.O. Box 729
Pinedale, Wyoming 82941

Sweetwater County
Mr. Ralph Simnacher
Box 73
Farson, Wyoming 82932

Uinta County
Mr. Neal Tuft
228 9th Street
Evanston, Wyoming 82930

APPENDIX 4

APPLICATION EQUIPMENT, CALIBRATION AND MAINTENANCE

Appendix 4

APPLICATION EQUIPMENT, CALIBRATION AND MAINTENANCE

Michael A. McNamee

Extension Agricultural Engineer

The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the Wyoming Extension Service is implied.

The Wyoming Agricultural Extension Service is an equal opportunity educational organization.

Issued in furtherance of agricultural Extension work, acts of May 8 and June 30, 1914, in cooperation with the U. S. Department of Agriculture, N. W. Hilston, Dean and Director, Agricultural Extension Service, University of Wyoming, Laramie 82071

SECTION III

Calibrating Chemical Applicators

Most pesticides must be applied at very precise rates if satisfactory results are to be obtained. Applying too little will result in poor control while too much pesticides may injure crops and livestock or produce unwanted residues which make soils, plants, or animal tissues unusable. *Correct application rate is one factor which the operator can control.*

Accurate application of chemical pesticides depends on accurate calibration of the application equipment. Calibration means to determine the output of the equipment under controlled and precise conditions.

A. Calibrating Spray Equipment

Speed and *pressure* are two variables that affect all types of spray equipment. Changing either speed or pressure at any time during a spraying operation will change the application rate. Both must be maintained at a constant level throughout the spraying operation.

1) *Speed.* Spraying equipment should be calibrated at the same speed to be used in the field. A change in speed of only 1 mph from the calibration speed can cause an underspray or overspray of 20% or more. The spray rate for speeds other than the calibration speed can be calculated, if necessary, in the following manner:

$$\text{Calculated spray rate} = \frac{\text{Calibrated speed (mph)} \times \text{Calibrated spray rate (gpa)}}{\text{New speed (mph)}}.$$

EXAMPLE

A sprayer calibrated at 5 mph sprayed at the rate of 15 gallons per acre. How much spray will it apply if drive at 3 mph?

$$\frac{5 \text{ mph} \times 15 \text{ gpa}}{3 \text{ mph}} = 25 \text{ gpa (a 67\% increase)}.$$

Most newer tractors are equipped with a ground speed-tachometer combination. These are satisfactory speed indicators except where drive wheel slippage is excessive. If the spray equipment is not equipped with a satisfactory ground speed indicator, ground speed can be determined by checking the time required to drive between two stakes 88 feet apart. The speed is determined from the formula:

$$\text{Speed (mph)} = \frac{60}{\text{Time required to travel 88 feet (seconds)}}.$$

EXAMPLE

The time required to travel 88 feet is 24 seconds. The traveling speed of the equipment is:

$$\frac{60}{24} = 2\frac{1}{2} \text{ mph.}$$

The following table shows the time required to travel 88 feet at different speeds.

Time required to travel 88 feet (seconds)	Speed (mph)
60	1
30	2
20	3
15	4
12	5
10	6

For speeds greater than 6 mph, more accurate results will be obtained if the distance traveled is doubled or tripled. Multiply the top of the equation by the same factor used to increase the distance.

Caution--When determining speed by the above method the trial should be made from a running start in the field where the spraying will be done or where conditions are similar. The sprayer should be equipped with a throttle which can be returned to the same position for spraying that was used in determining speed. Speedometers on pickup trucks are not sufficiently accurate for precision ground speed control. Trucks with mounted sprayers should be equipped with a hand throttle and an engine tachometer to obtain accurate speed control.

2) *Selecting desired speed.* Calibration curves furnished by the manufacturer for their nozzle tips will give the operator some clue as to the ground speed, pressure, and nozzle opening size needed for a given rate of application. An operator may have occasion to apply a specific rate (gallons per acre). Lacking the manufacturers ratings he can determine mathematically the necessary ground speed for the desired application rate using the following formula.

$$\text{Required speed (mph)} = \frac{\text{fluid ounces per minute (one nozzle)} \times 46.4}{\text{nozzle spacing on boom (inches)} \times \text{desired application rate (gal. per acre)}}.$$

EXAMPLE

You want to deliver 9 gallons of spray per acre. The nozzles are spaced 20 inches apart on the boom. You collect the discharge from one nozzle for 1 minute and it measures 16 ounces. To deliver 9 gallons of spray per acre your speed will be:

$$\text{Speed} = \frac{16 \times 46.4}{20 \times 9} = 4.1 \text{ mph.}$$

3) *Application uniformity.* There are several ways to calibrate spraying equipment but all depend on one factor for accuracy--*uniform application.* Before attempting to calibrate any sprayer, check the nozzles on the unit individually to see if they are delivering approximately the same amount of spray.

Check nozzle tips by placing containers of the same size and shape under each nozzle and operate the sprayer at the normal pressure. If the containers fill unenvenly or too fast, look for worn tips. A plugged nozzle or screen will cause a container to fill slowly. Measuring the output of each nozzle will also indicate if thev are performing evenly. Replace the tip if the variation is over 5%. Replace all tips if the flow is 20% greater than the manufacturers rating.

4) *Select proper pressure.* Most nozzle orifices have been machined to give the most effective spray pattern at pressures of 30 to 40 psi. Pressures higher than this produce a large number of fine droplets and increase the potential of having the herbicide moved from the target area by drift. Conversely, low pressures can create large droplets, weak spray patterns, and poor coverage. Any time it is necessary to change the spray rate to an extent that cannot practicably be done within the recommended pressure range, a different set of nozzles should be selected. Always use the same pressure for spraying that was used for calibration.

B. Calibration of Hand Sprayers

Spray equipment with single nozzles or three to four nozzle booms are used by the homeowner for lawn and garden care and also by the researcher for eastblishing experimental plots. Single high pressure nozzles are also widely used on rights-of-way spray operations, and spot treatments by Weed and Pest District personnel and by farmers and ranchers. Accurate calibration of this type of equipment is very simple but seldom done. Over application is a common occurrence.

1) *Compressed air sprayer.*

Step 1. Mark out a square rod (16-1/2 ft. x 16-1/2 ft.)

Step 2. Put a known amount of water in the spray can, (2 quarts is usually enough)

Step 3. Pump the sprayer to 30-40 lbs pressure if it has a pressure guage. If not, count the number of strokes used to pump up the sprayer.

Step 4. Spray the square rod, walking at the same speed you plan to use in spraying the plot or yard.

Step 5. Measure the water remaining in the spray can and subtract this amount from the original amount. Be as accurate as possible.

Step 6. Compute the rate of application per acre by the following formula:

gallons per acre = amount sprayed out (cups) x 10

There are 160 square rods per acre and 16 cups per gallon. By dividing 16 into 160 constant 10 used in the formula is obtained.

EXAMPLE

You find that 4 cups of water are applied to 1 square rod. The application rate is 4 x 10 = 40 gallons per acre.

2) *High pressure hand gun.* Single nozzle, high pressure equipment is calibrated utilizing time required (in seconds) to spray a 1 square rod plot. Accuracy is increased if the plot is marked out on the species of plant to be sprayed.

After determining the time required (in seconds) to spray the square rod plot, catch the spray from the nozzle for the same amount of time required to spray the square rod plot and measure. The rate of application is determined by the same formula used above.

C. Calibration of Boom Sprayers

1) *Refill method.* The refill method is probably the simplest of the many methods available for calibrating boom-type sprayers.

Step 1. Measure the *effective* spray width of the boom. This is the width covered by the spray at ground level.

Step 2. Divide the effective width of the boom into 43,560 (square feet/acre) to determine the distance the sprayer must travel to cover an acre. Measure this distance on the ground to be sprayed. Since the distance required to spray is usually quite large, the common practice is to reduce the course to a fraction of an acre, i.e. 1/10 or 1/16 acre.

Step 3. Fill the spray tank and adjust the *pressure* (30-40 psi for most uses) and the tractor or applicator speed to the *speed* to be used in the field.

Step 4. Fill the spray tank to a known reference line and spray the measured distance.

Step 5. Measure carefully the amount of water required to refill the tank to the reference line. It is desirable to make two to three runs to obtain more accurate calibration. Returning the sprayer to exactly the same spot each time it is refilled will also increase accuracy.

Step 6. Multiply the number of gallons required to refill the tank to the previously designated reference line by the reciprocal of the fraction of an acre sprayed (1/10, 1/6, 1/4, etc.) to determine the delivery rate in gallons per acre at the speed and pressure utilized.

EXAMPLE

A sprayer with a 20 foot effective spray width is calibrated on 1/10 of an acre and requires 4 gallons of water to refill the tank after the calibration run.

Step 1. 20 feet effective boom width

Step 2. $\frac{43,560}{20}$ = 2,178 linear feet necessary to cover one acre

1/10 of an acre = 218 linear feet

Step 3. 4 gallons of water is required to refill the tank

Step 4. 4 x 10 = 40 gallons per acre

2) *Nozzle method.* The nozzle method of calibration is a quick and accurate way to calibrate any sprayer as long as the ground speed is known and can be accurately controlled. It can be used to calibrate in the shop or in the farm yard and is valuable as a quick check for nozzle wear. By using this method it is possible to accurately predict the spray rate at any controlled speed.

The nozzle method requires checking only one nozzle on the sprayer, but assumes all nozzles are delivering the same amount. Check all nozzles at first to be sure they are delivering nearly the same amount of spray. The nozzle method is based on the formula:

$$\text{Spray rate (gals. per acre)} = \frac{\text{one nozzle output (ounces per minute) x 46.4*}}{\text{one nozzle coverage (inches) x speed (miles per hour)}}.$$

Step 1. Set the *pressure* the same as is to be used in the field and catch the water from *one nozzle* for *one minute*--measure water carefully.

Step 2. Measure coverage of a nozzle in *inches*. On a boom sprayer, *the coverage is the same as the nozzle spacing on the boom.*

Step 3. Multiply the amount (ounces) of water pumped in one minute (from Step No. 1) by 46.4 (a constant).

Step 4. Multiply the forward speed of the sprayer (miles per hour) by the nozzle spacing (inches).

---

*This constant applies to delivery measured in ounces, derived as follows:

$$\text{Constant} = \frac{43,560 \text{ square feet/acre x } 12 \text{ inches/foot}}{88 \text{ feet/minute (1 mph) x } 128 \text{ ounces/gallon}} = 46.4.$$

Constants to use when the delivery is measured in other units are:

milliliters - 1.57 pints - 742.5 gallons - 5940.

Step 5. Divide the answer obtained in Step No. 3 by the answer in Step No. 4. This is the gallons of water the sprayer is delivering per acre.

EXAMPLE

A sprayer has 16 nozzles spaced 18 inches apart and the boom covers a 24 foot swath. When operated at 40 psi, one nozzle delivers 40 ounces of water in 1 minute. The sprayer is to be operated at 4 mph. What is the application rate?

Step 1. 40 ounces per minute (measured)

Step 2. Nozzle spacing = 18 inches

Step 3. 40 ounces x 46.4 = 1,856

Step 4. 4 mph x 18 inches = 72

Step 5. $\frac{1,856}{72}$ = 25.8 gallons per acre applied

Caution--Be sure all nozzles are delivering at nearly the same rate when using this method of calibration.

3) *Another refill method.*

Step 1. Fill the sprayer tank to the very top or to some mark.

Step 2. Spray exactly 660 feet (40 rods) at the same speed and pressure to be used when spraying.

Step 3. Return to the exact starting position and refill the tank to the starting level, measuring in gallons the amount of water used.

Step 4. Calculate the application rate as follows:

$$\frac{\text{gallons used x } 66^*}{\text{width of spray swath in feet}} = \text{gallons per acre sprayer is applying.}$$

EXAMPLE

After spraying a swath 12 feet wide and 660 feet long, 8 gallons of water are required to refill the sprayer. The application rate is:

$$\frac{88 \text{ gallons used x } 66}{\text{spray swath (12 feet)}} = 44 \text{ gallons per acre.}$$

---

*A constant derived by dividing 43,560 square feet/acre by 660 feet sprayed and represents the width required to spray 1 acre.

D. Calibrating Band Applicators

Preemergence spraying (spraying after the crop is planted but before it comes up) or preplant spraying (application before the crop is planted) are becoming widely used practices in cultivated crops. Many of the herbicides used are expensive and one way to overcome the problem of cost is to apply the chemical as a *band spray*. Band spraying is the application of the herbicide in a band, usually about 1/3 to 1/2 as wide as the row spacing, immediately over the crop row, leaving the area between the crop rows unsprayed. In this way, only 1/3 to 1/2 as much material is used per cropped acre as when full coverage spraying is used; with a resultant saving in chemical cost. The area between the rows can be cultivated clean to reduce the weed infestation.

When application rates are recommended for weed control chemicals, such as 2 pounds per acre, this much active ingredient is to be applied to the area covered by spray. With full coverage spraying the entire field would receive this amount of chemical, but with band spraying only the sprayed band receives chemical at this rate. Thus, if 14 inch bands were sprayed on 42 inch rows, for every acre of cropland treated only 1/3 of an acre will be sprayed. Therefore, if 2 pounds per acre of chemical were recommended, *2 pounds of active ingredient would be applied to each acre actually sprayed* but only 2/3 pounds of chemical would be required to treat an acre of cropland.

The purpose of calibration is to determine the amount of spray applied to the band area. This figure is used to determine the amount of chemical to mix with carrier (water) in the tank. The concentration is figured exactly the same way as it would be if the spray was full coverage.

1) *Calibration.* As with full coverage spraying, calibration is very important. The margin of selectivity or safety of preplant or preemergence herbicides on such crops as sugar beets, fieldbeans, and corn, is sometimes narrow and accurate application is quite necessary.

Calibration can be done with various calibration jars on the market, or by using various other methods.

a. *Refill method.*

1. Measure off a known distance, such as 300 or 400 feet.

2. Fill the sprayer tank with water to a known mark. Spray the measured area at the *same speed and pressure* that would be used in the field.

3. Refill the tank to the known mark, measuring carefully the amount of water used.

4. Calculate the gallons per acre (gpa) sprayed by the following formula:

$$\frac{43{,}560 \times \text{gallons used}}{\text{distance traveled (feet)} \times \text{band width (in feet)} \times \text{no. of bands}} = \text{gpa.}$$

EXAMPLES

If 1/2 gallon of water were sprayed on a 300 foot strip in two 14 inch bands, the acre rate would be.

$$\frac{43{,}560 \times .5}{300 \times 1.2 \times 2} = 30 \text{ gpa sprayed.}$$

If the same amount of water was sprayed on two 6 inch bands the acre rate would be:

$$\frac{43{,}560 \times .5}{300 \times .5 \times 2} = 72.6 \text{ gpa sprayed.}$$

b. *Nozzle method.* The nozzle method described for a boom sprayer can also be used to calibrate a band sprayer. The formula is:

$$\text{Spray rate (gpa)} = \frac{\text{nozzle output (ounces per minute)} \times 46.4}{\text{nozzle coverage (inches)} \times \text{speed (mph)}}.$$
$$\text{(band width)}$$

Step 1. Adjust the pressure to the amount that will be used in the field and collect the spray from each nozzle for 1 minute and measure. (If all nozzles deliver equal amounts as they should, only one nozzle needs to be measured.)

Step 2. Measure the band width (coverage) in inches.

Step 3. Substitute the values from Steps 1 and 2 into the formula and calculate the gallons per acre sprayed on the band.

EXAMPLES

If the nozzle delivers 36 ounces of water in 1 minute at 30 pounds pressure and the speed to be used is 3 mph, the spray rate on a 14 inch band will be:

$$\frac{36 \times 46.4}{14 \times 3} = 39.8 \text{ gpa.}$$

In the above example if the band width were reduced to 7 inches the spray rate *on the band* would be:

$$\frac{36 \times 46.4}{7 \times 3} = 79.8 \text{ gpa.}$$

Changing the width of the band has a pronounced effect on the spray rate and thus on the concentration of chemical in the spray tank. It should be pointed out, however, that if the speed and row spacing remain the same in the two examples, the amount of water used per crop acre will also remain the same.

E. Calibration of Granular Applicators

Granular applicators can be calibrated in a manner similar to those for sprayers. The amount of granules applied by applicators depends on the size of the metering opening, speed of travel, field roughness, and the flow rate of the granule which is affected by size, shape, and density of the granules, temperature, and humidity. Because of such variables, it is difficult to predict a certain rate at a certain setting. Use the manufacturer's instructions as a guide, but run a check by actually catching the granule discharge per row from a measured area.

1) *Field calibration.*

(Use the following calibration steps:)

1. Adjust orifice (delivery openings) on applicator unit(s) at manufacturer's setting and fill hopper(s) with granules to be applied.

2. Set tractor or unit speed as it will be operated in the field.

3. Operate the unit over a measured distance of several hundred yards in a freshly prepared seedbed. Collect the ganules from each discharge tube. All should be delivering equal amounts.

4. Accurately weigh the amount of chemical delivered by each outlet.

5. Calculate the area that would have been treated over the course. Multiply individual band width (in feet) times number of rows times distance covered (in feet). This value equals the area of the measured treated course, in square feet.

6. From No. 4 and No. 5 calculate the amount of granules applied per acre (application rate) as follows:

$$\text{Pounds/A (granules)} = \frac{43{,}560 \times \text{pounds granules applied over course}}{\text{area of measured course in square feet}}$$

This value is pounds per acre (lb/A) of granular formulation applied. To determine amount of active ingredient applied, multiply lb/A by percent active ingredient and divide by 100 as follows:

$$\text{Lb/A} = \frac{\text{lb/A granules} \times \text{percentage active ingredient}}{100}$$

7. Complete calibration by repeatedly adjusting and testing until desired quantity of granules are delivered. Record the proper setting for future reference.

EXAMPLE

A granular applicator treats bands 1 foot wide on three rows (3 rows x 1 foot = 3 feet treated). When driven over a distance of 870 feet each tube delivers 4/10 pound of granules (3 rows x 4/10 pound = 1.2 pounds) at the setting used.

$$\text{Lb/A} = \frac{43{,}560 \times 1.2 \text{ lb granules}}{3 \text{ ft.} \times 870 \text{ ft.}} = 20 \text{ lb/A granules.}$$

If the active ingredient concentration of the granules was 20%, the rate of active material applied per acre would be:

$$\text{Lb/A} = \frac{20 \text{ lb/A granules} \times 20}{100} = 4 \text{ lb/A active ingredient.}$$

2) *Shop Calibration.* PTO driven granular applicators can be calibrated in the shop by calculating the distance that will be traveled in 1 minute, then collect granules for 1 minute with the applicator running at field speed. Values obtained in this manner can be substituted in the above formulas.

EXAMPLE

The application will be run at 3 mph in the field and the amount of granules collected in 1 minute at this speed is 1/8 pound per tube on a three row distributor. The band width will be 12 inches. The application rate will be:

$$\frac{43{,}560 \times 0.375}{3 \times (3 \times 88)^*} = 20.6 \text{ lb. formulation per acre.}$$

3) *Calibrating granular insecticides.* The label on some granular insecticides recommends applying so many ounces of formulation per 1,000 feet of row. Calibration is complete when the desired amount of formulation is collected in the prescribed distance.

Many companies offer calibration tubes for their materials which can be attached to the distributor tube and will give a direct reading for that particular formulation. *These tubes can be used only for the designated chemical.*

---

*From page V-14, mph x 88 feet at 1 mph = feet per minute.

F. Computing Chemical Concentration

1) *Liquid formulations.* The label on all liquid herbicides states the number of pounds of acid equivalent or active ingredient per gallon of concentrate. The most common formulation is 4 pounds active ingredient or acid equivalent per gallon. However, there are some formulations that contain 2.0, 3.3, and 6.0, pounds per gallon.

From calibration, the amount of spray applied per acre has been determined. By dividing capacity of the sprayer tank (in gallons) by the spray rate (gallons per acre) the number of acres a tank will spray can be calculated. Enough chemical (active ingredient = a.i.) is then added to the tank to spray that many acres at the recommended rate.

Another way to think of the problem is that for every acre's worth of water added to the tank, an additional acre's worth of active ingredient must also be included.

The formula shown below can be used to determine the amount of chemical to be added to a sprayer tank to obtain the desired application rate.

$$\text{Chemical to be added} = \frac{\text{no. acres sprayed x chemical rate (lb. a.i./acre)}}{\text{chemical concentration (lb. a.i./gallon)}}.$$

EXAMPLE

How many gallons of a herbicide with 2 pounds active ingredient per gallon should be added to 50 gallons of water for a 10 gallon per acre sprayer to apply the chemical at the rate of 1/1/2 pounds per acre?

$$\text{Acres covered} = \frac{50 \text{ gal}}{10 \text{ gal/A}} = 5 \text{ acres capacity.}$$

$$\text{Chemical needed} = \frac{5 \text{ acres x } 1.5 \text{ lb/acre}}{2 \text{ lb. a.i./gal}} = 3.75 \text{ gal.}$$

a. *Band application.* When figuring chemical for band application, the spray rate *on the band* is used to determine acreage covered by a tank of water. The chemical added is then based on the banded area sprayed and not the cropped area.

2) *Wettable powders and granules.* These materials have active ingredients expressed as a percentage of the total weight and may vary from 5% to 80% active ingredient. A simple formula used to calculate the amount of commercial product required is as follows:

$$\frac{\text{Application rate (lb. a.i./acre)}}{\text{Percentage active ingredient (expressed as a decimal)}} = \text{weight of formulation required.}$$

For example, if you have a herbicide that is 80% active ingredient and you wish to apply 2 pounds/acre active ingredient then:

$\frac{2.0}{.80}$ = 2.5 lb. of commercial formulation is needed to give 2 lb. of active ingredient per acre.

3) *Small plot square rod basis.* When calculating chemical amounts for small plot work, very small quantities are used. The values listed below plus those in Appendix Tables 1 and 2 will be useful for making these calculations.

1 acre = 160 sq. rods
1 quart = 946 cc. or ml.
1 gallon = 3,784 cc. or ml.
1 gallon = 4 quarts
1 pound = 453.6 grams
1 pint = 16 ounces
1 ounce = 29.56 cc. or ml.
1 acre = 43,560 sq. feet

EXAMPLE

You want to apply 1 pound/acre active to a lawn for dandelion control and the liquid material you have contains 4 pound/gallon active ingredient. Each quart therefore contains 1 pound active.

$\frac{946 \text{ ml/lb. a.i.}}{160 \text{ sq. rods/A}}$ = 5.9 ml/sq. rod to give a rate of 1 lb/A.

80% active wettable powder

$\frac{1.0 \text{ lb. active needed}}{.80 \text{ active material}}$ = 1.25 lb. of formulation to give 1.0 lb. active.

1.25 x 453.6 = 567 g. to equal 1 lb. active.

$\frac{567 \text{ g/lb. a.i.}}{160 \text{ sq. rods/A}}$ = 3.5 g/sq. rod - 1 lb/A.

SECTION IV

Sprayer Maintenance and Cleaning

Most trouble with sprayers can be traced to foreign matter that clogs screens and nozzles and sometimes wears out pumps and nozzles. The following suggestions will help reduce maintenance problems and prolong sprayer life.

1. *Use clean water.* As a rule of thumb use water that looks clean enough to drink. Water pumped directly from a well is best. Water from ponds or stock tanks will probably contain enough small particles to plug nozzle screens even though it looks clean. If it is necessary to use pond water, filter it before filling the tank.

2. *Keep screens in place.* A sprayer system usually has screens in three places; a course screen on the suction hose, a medium screen between the pump and the boom, and a fine screen in the nozzle. The nozzle screen should be fine enough to filter particles which will plug the tip orifice. A 100 mesh screen is normally adequate for nozzles. Screens should be in place at all times with one possible exception. When wettable powders are used it is difficult to keep them 100% in suspension and nozzle screens may have to be removed to prevent excessive clogging.

3. *Never use a metal object to clean nozzles.* To clean, remove the tips and screens and clean them in water or a detergent solution using a soft brush. The orifice in a nozzle tip is a precision machined opening. A thrust from a pin, knife or other metalic object can completely change the spray pattern and capacity of the tip.

4. *Flush sprayers before using them.* New sprayers may contain large amounts of metallic chips and dirt from the manufacturing process. Sprayers which have been idle for a while may contain bits of rust and dirt. Remove the nozzles and flush the sprayer with clean water. Clean *all* screens and nozzles thoroughly before trying to use the sprayer.

5. *Clean sprayer thoroughly after use.* After each day's use, thoroughly flush the sprayer with water, inside and out, to prevent corrosion and accumulation of chemicals. Be sure to discharge cleaning water where it will not contaminate water supplies, streams, crops, or other plants and where puddles will not be accessible to children, pets, livestock, or wildlife.

When changing chemicals or when finished spraying for the season, clean the sprayer thoroughly both inside and out. Some chemicals, such as 2,4-D, are particularly persistent in the sprayer and must be removed completely to prevent possible crop damage from other spraying operations. In other cases, chemical reaction may cause coagulation or loss of effectiveness of the chemical. For thorough cleaning between chemicals or at the end of the season, the following procedure is recommended.

a. Remove and clean all screens and tips in kerosine or a detergent solution using a soft bursh.

b. Mix one box (about 1/2 lb.) of detergent with 30 gallons of water in the tank. Circulate the mixture through the bypass for 30 minutes, then flush it out through the boom.

c. Replace the screens and nozzle tips.

d. Fill the tank about 1/3 to 1/2 full of water and add 1 quart of household ammonia to each 25 gallons of water. Circulate this mixture through the system for 5 minutes, allowing some to go out through the nozzles. Keep the remainder of the solution in the system overnight, and then run it out through the nozzles.

e. Flush the system with a tank full of clean water by spraying through the boom with nozzles removed.

6. *Prepare the system for off season storage.* When the pump is not in use, fill it with a light oil and store it in a dry place. If the pump has grease fittings, lubricate them moderately from time to time. Over lubrication can break seals and cause the pump to leak. Remove nozzles and screens and place them in a light oil for storage. Store the sprayer, hoses and booms in a dry shed.

APPENDIX 5

WYOMING WEED CONTROL GUIDE 1979

INDEX

	Page
Wyoming Weed Control Guide	3
Weed Response Chart — Preplant and Preemergence	4
Preplant and Preemergence Treatments	5
Corn	5
Fieldbeans	11
Potatoes	13
Sorghum	14
Sugarbeets	15
Sunflowers	16
Wheat-Fallow-Wheat	17
Weed Response Chart — Postemergence	18
Postemergence Treatments	19
Barley and Spring Wheat	19
Corn	20
Oats	21
Potatoes	21
Sorghum	22
Sugarbeets	22
Winter Wheat	23
Forage Crops, Pasture and Rangeland	23
Alfalfa	23
Grass Seedlings	26
Downybrome (Cheatgrass)	26
Wild Iris	27
Sagebrush	27
Prickly Pear Cactus	27
Poisonous Plants	28
Snakeweed, Yucca, Rabbitbrush	29
Windbreaks and Tree Plantings	29
Problem Weeds and Woody Plants	31
Specific Areas	41
Aquatic Weeds	41
Submersed	42
Algae	43
Non-Cropland Areas	45
Herbicide Glossary	48
Sprayer Calibration	58
Conversion Tables	59
Metric Conversion	59
Application Record	63

Persons seeking admission, employment, or access to programs of the University of Wyoming shall be considered equally without regard to race, color, national origin, sex, religion, political belief or handicap.

Issued in furtherance of Agricultural Extension Work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture.

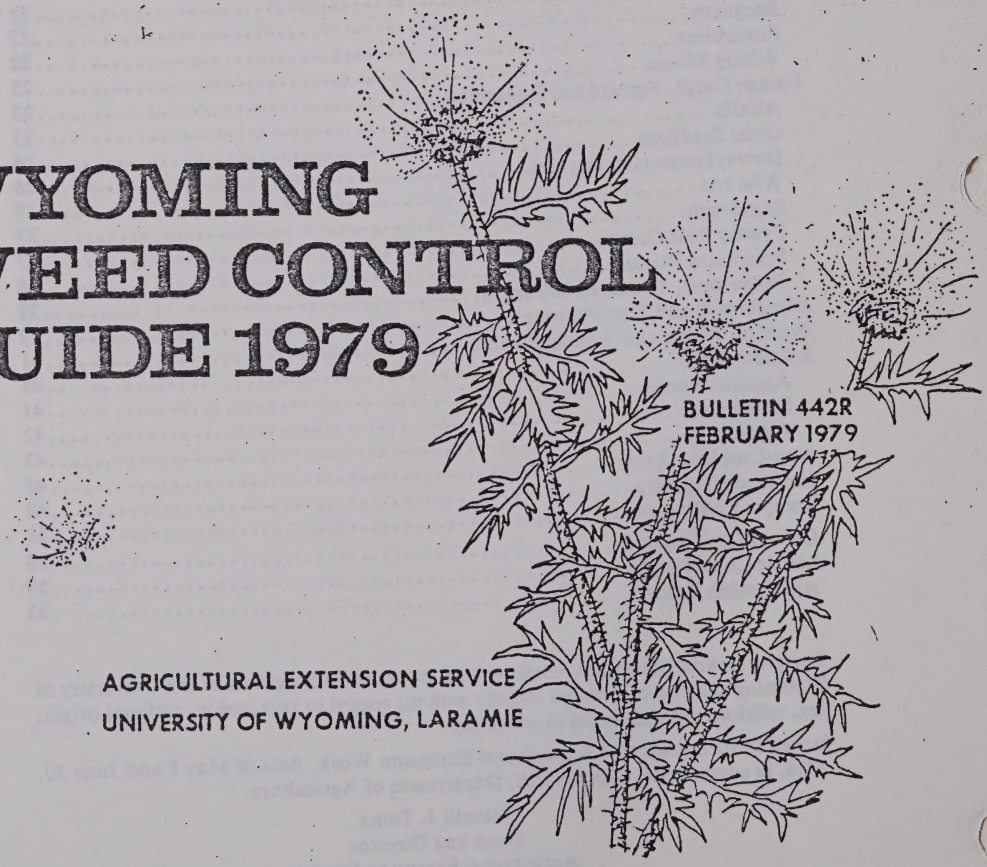
Harold J. Tuma
Dean and Director
Agricultural Extension Service
University of Wyoming
Laramie, WY 82071

2-79--6M--20

84

Appendix 5

WYOMING WEED CONTROL GUIDE 1979



BULLETIN 442R
FEBRUARY 1979

AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF WYOMING, LARAMIE

COMPARATIVE WEED CONTROL RATINGS OF COMMONLY USED HERBICIDES IN WYOMING

PREPLANT AND PREEMERGENCE

Weed Control Ratings

E Excellent (90-100%)
G Good (70- 90%)
F Fair (50- 70%)
P Poor (0- 50%)

	Grass Weeds				Broadleaf Weeds									
	barnyardgrass	fall panicum	foxtail (green)	sandbur	black nightshade	kochia	lambsquarters	pigweed	Russian thistle	smartweed	sunflower	wild buckwheat	crop tolerance[1]	soil persistence[2] (months)
CORN														
AAtrex/Atrazine	G	P	G	F	E	E	E	E	E	E	E	E	E	6-24
Bladex	G	F	G	F	F	E	E	E	E	E	G	E	G	2-4
Bladex/AAtrex/Atrazine	E	F	G	F	E	E	E	G	E	E	G	E	G	6-18
Dual	E	E	E	F	G	P	G	G	P	P	P	P	E	2-6
Dual/AAtrex/Atrazine	E	G	E	F	E	E	E	E	G	G	G	G	E	6-18
Eradicane	E	E	E	G	E	F	G	G	P	P	P	E	G	1-2
Eradicane/AAtrex/Atrazine	E	E	E	G	E	E	E	E	G	G	F	G	E	6-18
Lasso	E	E	E	F	G	P	G	G	P	P	P	P	E	2-4
Lasso/AAtrex/Atrazine	E	G	E	F	E	E	E	E	G	G	G	G	E	6-18
Lasso/Bladex	E	E	E	F	E	E	G	G	G	G	F	G	G	2-4
Prowl/AAtrex/Atrazine	E	E	E	F	G	E	E	E	G	G	G	G	G	6-18
Sutan+	E	E	E	G	G	P	G	F	P	P	P	F	E	1-2
[illegible]+/AAtrex/Atrazine	E	E	E	G	E	E	E	E	G	G	F	G	E	6-18
[illegible]+/Bladex	E	E	E	G	G	E	E	G	G	G	F	G	G	2-4
SORGHUM														
AAtrex/Atrazine	G	P	G	F	E	E	E	E	E	E	E	E	F	6-24
Ramrod/Bexton	G	G	G	F	P	P	F	G	P	F	P	F	G	1-2
Ramrod/Bexton/AAtrex	G	F	E	F	G	E	E	E	G	G	G	G	G	6-18
SUGARBEETS														
Ro-Neet	E	E	E	G	G	P	E	F	P	G	P	P	G	1-2
Nortron	E	-	E	-	G	G	G-E	G-E	-	-	-	F	G	4-6
FIELDBEANS														
Eptam	E	E	E	E	E	F	G	G	P	P	P	F	G	1-2
Eptam/Treflan	E	E	E	E	F	E	G	G	F	P	P	F	E	6-12
Lasso	E	E	E	F	G	P	G	F	F	P	P	P	G	2-4
POTATOES														
Eptam	E	E	E	E	E	F	G	G	P	P	P	F	G	1-2
Eptam/Treflan	E	E	E	E	F	E	G	G	F	P	P	F	E	6-12
Sencor/Lexone	G	G	G	P	G	F	E	E	G	G	F	E	G	2-6

W[illegible]esponse may be altered by environmental conditions affecting growth, soil type, and rates of application. Ratings [illegible]so vary somewhat from season to season and crop production areas within the state.

[1] Crop varieties can vary in their response to herbicides and/or mixtures.

[2] Soil persistence varies with soil types and moisture received as rainfall or irrigation.

85

WYOMING WEED CONTROL GUIDE 1979

AUTHORS: H.P. Alley, Professor of Weed Science and Extension Weed Science Specialist, and N.E. Humburg, Assistant Professor of Weed Science

The cultural and chemical suggestions listed in this guide are based on results of experiments and field demonstrations in Wyoming and elsewhere. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by the Cooperative Extension Service implied.

READ THE LABEL

Use chemicals only as listed on the label. Follow instructions; heed all cautions and warnings.

APPLY ONLY AS DIRECTED

Federal law authorizes seizure of any raw agricultural commodity moving in interstate commerce which carries a pesticide residue in excess of the established tolerance.

STORE IN ORIGINAL, LABELED CONTAINERS

Keep chemicals out of reach of children, pets, livestock and irresponsible people.

ELIMINATE HAZARDS FROM CONTAINER

Rinse empties that contain liquids three times. Burn paper bags and fiber drums. Stay out of the smoke. Bury unused materials and crushed containers.

The **USER IS RESPONSIBLE** for chemical residues on his own crop as well as for problems caused by drift or soil contamination from his property to other properties or crops.

RESTRICTED USE HERBICIDES

Some herbicides have been classified as restricted use by EPA. Other herbicides or some of their uses may be classified as restricted use at some future date. The label will so indicate. **ONLY CERTIFIED PRIVATE OR COMMERCIAL APPLICATORS SHOULD APPLY OR SUPERVISE THE APPLICATION OF RESTRICTED USE HERBICIDES. CONSULT YOUR UNIVERSITY EXTENSION AGENT IF YOU NEED TO BE CERTIFIED.**

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
CANADA THISTLE (cont.)	2,4-D amine	10.0 gal (94.0 *L*)	Early spring or fall	Use only on non-cropped areas. To be effective the treatment must be applied early in spring or fall after vegetative top growth is removed. Follow up with 2 lb of 2,4-D on regrowth and new seedlings.
	Amitrole T Cytrol T 2WS	2.0 gal (19.0 *L*)	When growing actively-bud stage	Non-cropped areas only. Will kill all vegetation.
	Tordon-22K 2PS or Tordon-212 or Tordon Beads 2G	2.0 to 4.0 qt (4.8 to 9.6 *L*) 4.0 to 8.0 qt (9.6 to 19.0 *L*) 50.0 to 100.0 lb (56.2 to 112.0 kg)	Anytime during growing season	Spot or broadcast treatment. For broadcast treatment a permit for aerial and ground equipment must be obtained from State Department of Agriculture. *Consult Wyoming State label.*
	Banvel 4WS	4.0 to 8.0 qt (9.6 to 19.0 *L*)	Fall (rosette) or spring (early) bud stage	Banvel has clearance for use on pasture and rangeland up to 8 qt./A. *Do not* graze meat animals in treated fields within 30 days before slaughter. More severe restrictions for dairy animals.
	Banvel 2,4-D (Weedmaster)	2.0 qt (4.7 *L*)	Actively growing	For use on pastures or rangeland grass and non-cropped areas such as fencerows, roadways, wasteland, etc.
	Roundup 3WS	3.0 qt (7.1 *L*)	When plants are at least 10 inches or more in height or are approaching bud-stage	Fall treatment must be applied before frost. Allow 7 or more days after application before tillage. Can be used in cropping systems before emergence of barley, corn, oats, sorghum and wheat.

PROBLEM WEEDS AND WOODY PLANTS

The most optimum time to treat is when the weeds are actively growing. Best results are obtained with more than one treatment, with non-soil persistent chemicals. An application at bud-stage of growth and early fall will be more effective on most perennials than just one treatment.

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
	2,4-D amine or ester	1.5 qt (3.6 *L*)	Bud to bloom stage and in fall in non-cropped areas	In cropped or non-cropped areas. Treat twice a year for 2 to 3 years. The 1.5 lb/A rate may cause some injury to small grain but will be offset by decreased weed competition. *Do not* forage or graze treated grain fields for 2 weeks after treatment. *Do not use* treated straw for livestock feed (late treatment).
BURSAGE SKELETONLEAF	Tordon-22K 2PS	1.0 to 2.0 qt (2.3 to 4.7 *L*)	Spring or fall	For use on non-cropped areas. Read carefully and observe all label precautions.
	or			
	Tordon-212	2.0 to 4.0 qt (4.8 to 9.6 *L*)		Tordon-212 (1 lb picolinic acid + 2 lb 2,4-D/gal).
	Clean cultivation		Usually every 21 days	Intensive cultivation for one season usually reduces stand considerably. Cultivate 3 to 4 inches deep. Spray regrowth in August with 2 lb/A 2,4-D.
CANADA THISTLE	2,4-D amine or ester	1.5 qt (3.6 *L*)	Canada thistle in bud stage and in fall	In cropped or non-cropped areas, treat twice a year for 2 or 3 years. Same precautions as for Skeletonleaf bursage.

[1]2,4-D, MCPA, 2,4,5-T and Silvex calculated on a 4 lb/gal (0.45 kg/*L*) acid equivalent.
[2]Rate in kilogram or liter per hectare within parentheses.

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
FIELD BINDWEED (cont)	Roundup 3WS	4.0 to 5.0 qt (9.6 to 11.9 *L*)	Late summer and fall	Reduced control when applied to drought stressed plants. Allow 7 or more days after application before tillage. Can be used in cropping systems before emergence of barley, corn, oats, sorghum and wheat.
	Clean cultivation		Usually every 10 to 14 days	For most effective and economical control, combine cultivation, cropping and spraying.
	2,4-D	1.5 qt (3.6 *L*)	Bud stage	In cropped or non-cropped areas, treat twice a year for 2 to 3 years. Plant begins growth early in spring. Same restrictions as listed under Bursage.
HOARY CRESS	2,4-D	4.0 to 6.0 qt (9.6 to 14.0 *L*)	Spring-early bud stage	Follow up with 2 lb/A 2,4-D on regrowth and seedlings. Non-cropland use only.
	Amitrole T or Cytrol T 2WS	8.0 qt (19.0 *L*)	When growing actively	Use only on non-cropped areas. Can be used later in growth stage than 2,4-D.
	2,4-D	1.0 qt (2.4 *L*)	Early spring	Prevents seed formation only.
	2,4-D	6.0 qt (14.2 *L*)	Early bud and in fall	Two treatments a year for 2 to 3 years necessary to reduce stand. Use only on non-cropland areas.
LEAFY SPURGE	Banvel 4WS	4.0 to 8.0 qt (9.6 to 19.0 *L*)	Bud to bloom stage	Same restrictions as listed under Canada thistle.
	Amitrole T or Cytrol T 2WS	2.0 gal (19.0 *L*)	Bud to bloom	Use only on non-cropland areas.

CANADA THISTLE (cont.)	Clean cultivation		Usually every 14 to 21 days	Intensive cultivation for one season. Cultivate 3 to 4 inches deep. Spray regrowth with 2 lb/A 2,4-D.
COMMON BURDOCK	2,4-D amine or LV ester	2.0 qt (4.7 *L*)	Before burdock reaches bud stage	Use the amine near susceptible plants.
COTTONWOOD	2,4-D ester	2.0 to 3.0 qt (4.7 to 7.1 *L*)	Full foliage or basal treatment anytime	Aerial application at least 5 gal carrier/A (47 *L*/ha). Annual treatment for 2 to 3 years may be necessary. Basal treatment: 2 qt of herbicide/10 gal (4.7 *L*/94 *L*) of diesel. Spray tree trunk to point of runoff or spray cut surface or frill cuts.
DYERS WOOD	2,4-D	1.5 to 2.0 qt (3.6 to 4.7 *L*)	Bud stage	Repeat 2,4-D application necessary for effective stand reductions.
	2,4-D	1.5 qt (3.6 *L*)	Bud stage or fall	On cropped or non-cropped areas, treat twice a year for 2 to 3 years. Same restrictions as listed under Bursage.
	Banvel 4WS	4.0 to 8.0 qt (9.6 to 19.0 *L*)	Bud to bloom stage and fall	For use in pasture, rangeland and non-cropland areas. Observe all precautions on label. Same precautions as listed under Canada thistle.
FIELD BINDWEED	Tordon-22K 2PS	2.0 to 4.0 qt (4.7 to 9.6 *L*)		
	or			
	Tordon-212	4.0 to 8.0 qt (9.6 to 19.0 *L*)	Anytime during growing season	Spot or broadcast treatment. For broadcast treatment a permit for aerial and ground equipment must be obtained from Wyoming Department of Agriculture. *Consult Wyoming State label.*
	or			
	Tordon Beads 2G	50.0 to 100.0 lb (56.2 to 112.0 kg)		

[1]2,4-D, MCPA, 2,4,5-T and Silvex calculated on a 4 lb/gal (0.45 kg/*L*) acid equivalent.
[2]Rate in kilogram or liter per hectare within parentheses.

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
MUSK AND PLUMELESS THISTLE (cont.)	Tordon-212	1.0 qt (2.4 *L*)	Spring or fall	Near 100% residual seedling control. Use only as spot tre ment.
PERENNIAL PEPPERWEED	2,4-D amine	4.0 to 6.0 qt (9.6 to 14.2 *L*)	Bud to bloom	Retreatment of regrowth and repeated treatments necessary.
PERENNIAL SOWTHISTLE	2,4-D	1.5 qt (3.6 *L*)	Bud stage and in fall	On cropped or non-cropland areas, treat twice a year for 2 to years. Same restrictions as listed under Bursage.
QUACKGRASS	Dowpon M 74SP	15.0 to 20.0 lb (16.9 to 22.5 kg)	Active growth 6 to 8 inches tall	Foliage spray. Use suggested rate and then cultivate 2 weeks a ter spraying.
	AAtrex Atrazine 80W	3.75 to 5.0 lb (4.2 to 5.6 kg)	Single application fall or spring	Apply 3.75 to 5.0 lb/A (4.2 to 5.6 kg/h) in spring or fall. Th plow 1 to 3 weeks after application. *Do not* disturb land un prepared for planting. Area treated can be seeded to corn.
	AAtrex Atrazine 80W	3.75+3.75 lb (4.2+4.2 kg)	Split application	First application of 3.75 lb should be either in the fall or 1 t weeks prior to plowing in the spring. Second application of 3. lb should be made 2 weeks before planting, at planting, or to 3 weeks after planting corn. *Do not* plant to crop other th corn for 2 years after initial application.

LEAFY SPURGE (cont.)	Tordon-22K 2PS or Tordon-212 or Tordon Beads 2G	4.0 qt (9.6 *L*) 2.0 gal (19.0 *L*) 100.0 lb (112.0 kg)	Anytime during growing season	Spot and broadcast treatment. *Consult Wyoming label* for aerial or ground application.
	Clean cultivation		Usually every 21 days	Leafy spurge is more persistent than Canada thistle. Combine cultivation, cropping and spraying for best results.
COMMON MILKWEED	Amitrole T Cytrol T 2WS	2.0 to 4.0 gal (19.0 to 38.0 *L*)	Bloom stage	Use only on non-cropland areas.
	Tordon-22K or Tordon-212 or Tordon Beads 5G	3.0 to 4.0 qt (7.1 to 9.6 *L*) 1.5 to 2.0 gal (14.2 to 19.0 *L*) 75.0 to 100.0 lb (84.0 to 112.0 kg)	Spring or fall	Use on non-cropland areas. Read label thoroughly before making application.
MUSK AND PLUMELESS THISTLE	2,4-D	1.5 to 2.0 qt (3.6 to 4.7 *L*)	Spring or fall	Fall treatment to rosettes and spring treatment before flower stalk lengthens. Annual treatments to control new seedlings.
	Banvel 4WS	0.5 qt (1.2 *L*)	Spring or fall	Seedling control and 2nd year growth if applied before flower stalk lengthens.

[1]2,4-D, MCPA, 2,4,5-T and Silvex calculated on a 4 lb/gal (0.45 kg/*L*) acid equivalent.
[2]Rate in kilogram or liter per hectare within parentheses.

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
RUSSIAN KNAPWEED	Banvel 4WS	5.0 to 8.0 qt (11.9 to 19.0 *L*)	Bud stage	Same restrictions as listed under Canada thistle.
	Banvel 2,4,-D (Weedmaster)	2.0 qt (4.7 *L*)	Actively growing	For use on pasture or rangeland grass and non-cropland and areas as fencerows, roadways, wasteland, etc.
	Clean cultivation		Usually every 21 days	A good cultural program combines intensive cultivation with use of competitive crops and selective sprays.
RUSSIAN OLIVE	2,4-D+2,4,5-T	2.0 qt (4.7 *L*) of most "Brush-killers"	Full leaf development	See remarks for Cottonwood.
TANSY	Tordon-22K 2PS or	1.5 to 2.0 qt (3.6 to 4.7 *L*)		
	Tordon-212 or	0.75 to 1.0 gal (7.1 to 9.5 *L*)	Spring or fall	For use on non-cropland areas.
	Tordon Beads 2G	35.0 to 50.0 lb (39.0 to 56.0 kg)		
	Banvel 4WS	4.0 to 8.0 qt (9.6 to 19.0 *L*)	Spring to bud-stage	Good control year of application—no residual control one year after treatment. Same restrictions as listed under Canada thistle.

	Roundup 3WS	2.0 to 3.0 qt (4.7 to 7.1 *L*)	Actively growing at least 8 inches in height	Allow 3 or more days after application before tillage, can be used in cropping systems, before emergence or barley, corn, oats, sorghum and wheat.
QUACKGRASS (cont.)	Eptam 7E	2.25 to 3.5 qt (5.2 to 8.3 *L*)	Incorporate after thoroughly chopping up rhizomes	Thoroughly chop up rhizomes before incorporating Eptam. Incorporate by disking or metering into irrigation water. Can be used for quackgrass control in corn and potatoes.
	Clean cultivation		Cultivate whenever regrowth is 2 to 3 inches tall	Least expensive way to control large areas of quackgrass. Roots should be brought to surface and allowed to dry. Spring-tooth harrow more effective than duckfoot.
	2,4-D	1.5 pt (3.6 *L*)	Early spring	Prevents seed formation only. Same restrictions as listed under Bursage.
	2,4-D	6.0 qt (14.2 *L*)	Bud stage or in fall	Knapweed is quite resistant to 2,4-D. Treat twice a year for 2 to 3 years. Use only on non-cropland.
	2,4-D amine	10.0 gal (95.0 *L*)	Early spring or fall	Follow up with 2 qt (4.7 *L*) 2,4-D on regrowth and new seedlings - non-cropland areas only.
RUSSIAN KNAPWEED	Tordon-22K 2PS or	2.0 to 4.0 qt (4.7 to 9.6 *L*)		
	Tordon-212 or	1.0 to 2.0 gal (9.5 to 19.0 *L*)	Anytime during growing season	Spot and broadcast treatment. For broadcast treatment a permit must be obtained from Wyoming Department of Agriculture. *Wyoming* label only.
	Tordon Beads 2G	50.0 to 100.0 lb (56.2 to 112 kg)		

[1]2,4-D, MCPA, 2,4,5-T and Silvex calculated on a 4 lb/gal (0.45 kg/*L*) acid equivalent.
[2]Rate in kilogram and liter per hectare within parentheses.

Area of Use	Herbicide	Apply this amount of commercial product per acre[1] (per hectare)[2]	Application Time	Remarks
WILLOWS (cont.)	Ammate	60.0 lb (67.5 kg)/ 100.0 gal (950.0 *L*) water	Full leaf stage	Add 4 to 8 oz spreader sticker to mixture. Consult label for further instructions.
	Hyvar X-L	5.0 to 10.0 cc/ 2 inch basal stem diameter	Basal treatment in spring or summer	Apply undiluted at 5 to 10 cc/2 inch basal stem diameter to base of trees.
WILD OATS	Avadex BW 4EC (Far-Go)	1.0 to 1.25 qt (2.4 to 3.0 *L*)	Preplant or pre-emergence before crop sprouts are ½ inch long	For barley and wheat. Incorporate 2 inches deep by disc or similar operation. *Do not* graze livestock on treated crop.
	Avenge 2EC	2.5 to 4.0 qt (2.9 to 9.6 *L*)	Wild oats in 3 to 5 leaf stage	Consult label on rates to apply according to wild oat density and wetting agent to use when spray volume is in excess of 10 gpa (95 *L*/ha). Avenge can be tank mixed with 2,4-D amine or ester, MCPA amine or bromoxynil for broadleaf weed control.
	Carbyne 1EC	2.0 to 4.0 pt (2.2 to 4.5 *L*)	Majority of wild oats in 2-leaf stage (from time 2nd leaf appears to time 3rd leaf appears)	Control unsatisfactory if herbicide applied before 2 leaf stage. *Do not* graze livestock on treated areas until after harvest. *Sequential treatment:* if needed Carbyne can be applied twice-to 2 flushes of wild oats at 2 pt/A (2.2 *L*/ha) to fall-seeded wheat. *Late treatment:* can make a single application of 4.0 pt (4.5 *L*/ ha) when wild oats are in the 3 to 4 leaf stage.
	Carbyne 1EC	2.0 to 4.0 pt (2.2 to 4.5 *L*)	Majority of wild oats in 2-leaf stage (from time 2nd leaf appears to time 3rd leaf appears)	Control unsatisfactory if herbicide applied before 2 leaf stage. *Do not* graze livestock on treated areas until after harvest. *Sequential treatment:* if needed Carbyne can be applied twice-to 2 flushes of wild oats at 2 pt/A (2.2 *L*/ha) in fall-seeded wheat and fall-seeded barely. *Late treatment:* (4.5 *L*/ha) when wild oats are in the 3 to 4 leaf stage.

SCOTCH THISTLE	Same suggestions as listed for Musk and Plumeless thistle			
	2,4,5-T (Silvex)	2.0 qt (4.7 *L*)	Bud to bloom	Two treatments per year for a period of 3 to 4 years necessary t effectively reduce stands.
	Banvel 4WS	4.0 to 6.0 qt (9.6 to 14.2 *L*)	Spring or early fall	Retreatment of regrowth may be necessary.
TOADFLAX (Dalmation and yellow)	Tordon-22K 2PS	3.0 to 4.0 qt (7.1 to 9.6 *L*)		
	or			
	Tordon-212	1.5 to 2.0 gal (14.2 to 19.0 *L*)	Spring or fall	Use on non-cropland areas only.
	or			
	Tordon Beads 2G	75.0 to 100.0 lb (84.0 to 112.0 kg)		
	2,4-D ester	2.0 to 3.0 qt (4.7 to 7.1 *L*)	Full leaf development	By airplane - apply 2 to 3 qt/A (4.8 to 7.1 *L*/h) in 2 to 3 gal (1 to 28.5 *L*/h) diesel oil. Increase the volume of oil carrier fo dense stands or when water is used as a carrier. May requir treatment.
WILLOWS	2,4-D ester	2.0 qt (4.7 *L*) in 10 gal (95.0 *L*) diesel oil	Basal treatment anytime of year	Wet lower tree trunk to point of runoff.

[1]2,4-D, MCPA, 2,4,5-T and Silvex calculated on a 4 lb/gal (0.45 kg/*L*) acid equivalent.
[2]Rate in kilogram or liter per hectare within parentheses.

HERBICIDE GLOSSARY

The information presented in this section is intended only as a ready reference for general information on the herbicides most commonly used in Wyoming and included in this guide. The label for specific herbicides should be consulted for additional and more detailed information.

Trade Name	Chemical Designation	Leading Producer	Usual Form	Discussion
AAtrex	atrazine	Ciba-Geigy Shell	80% WP 4 lb/gal liquid	AAtrex is the Ciba-Geigy trade name for atrazine. Atrazine is available under several private labels; however, some labeled uses are only for AAtrex. Is a preplant, preemergence and post-emergence s-triazine for control of broadleaf and certain grass weeds in corn, sorghum, rangelands and for weed control in noncrop areas and industrial sites.
Ammatex	AMS	DuPont	Gran (85% and 95% active)	Primary use has been to kill woody plants and poison ivy. It can be used to prevent tree stumps from sprouting when applied to the freshyly cut stump or at the base of certain kinds of trees. Can be used also as a temporary soil sterilant.
Amitrol Weedazol amino-triazole	amitrole	Amchem American Cyanamid	90% soluble powder	For non-crop areas only. Effective as a foilage treatment for control of Canada thistle, hoary cress, quackgrass and cattails. Is an anti-chlorophyll agent which causes chlorosis in plants.
Amitrole-T Cytrol	amitrole-T	Amchem American Cyanamid	2 lb/gal soluble Conc. + 1% acrosol	Liquid formulation containing amino-triazole and ammonium thiocyanate (15%). Can be used for control of the same weeds as Amitrol but at approximately half rates.
Aquathal	See Endothal			

Spike 80W	5.0 to 20.0 lb (5.6 to 22.5 kg)	Apply before or during period of active weed growth. Use rates for annual weed control and the higher rates for per and hard-to-kill weeds.
Tandex	6.0 to 12.0 lb (6.75 to 13.5 kg)	Light rates for annual weed control and higher rates for p nials.
Ureabor (new improved)	435.0 to 1305.0 lb (489.0 to 1468.0 kg)	General sterilant containing 66.5% borate combinations, sodium chlorate, and 1.5% bromacil. Use light rate for a weed control and higher rate for perennial weed control.
Velpar 90SP	2.0 to 8.0 lb (2.2 to 9.0 kg)	Light rates give short term control (3 to 4 mo.). Has contac residual activity. High rate gives long term control (8 to 12

[1]Rate in kilogram or liter per hectare within parentheses.

Many more soil sterilants and mixtures of various compounds are available under different trade names. Consider the solubility, soil persistence, leachability etc., of each compound before using. Damage to trees, shrubs and other desirable vegetation may result from improper use.

Bexton	See Ramrod			
Bicep		Ciba-Geigy	Dual AAtrex 4.5 lb/gal	Mixture of 2.5 lb. of Dual and 2.0 lb./gal. AAtrex.
Bladex	cyanazine	Shell	80% WP 4 lb/ gal Fl.	A short soil residual triazine for grass and broadleaf weed control in corn and sorghum. It has a short residual life and is not expected to carry over to affect crops the following cropping season.
Brominal Buctril	bromoxynil	Amchem Rhodia Chipman	2 lb/ gal EC	A contact herbicide for selective control of broadleaf weeds in small grains. Wheat and barely are tolerant to bromoxynil from the one or two leaf stage up to flowering. Has advantage over 2, 4-D in that it can be used as a fall or early spring treatment. More effective for control of blue mustard, tansy mustard and wild buckwheat than 2, 4-D.
Brominal Plus Bronate		Amchem Rhodia Chipman	4 lb/ gal EC 2 lb/ Bromoxynil 2 lb/gal MCPA	A mixture of bromoxynil and MCPA. The combination makes possible a longer spraying season than possible with phenoxy herbicides. Crop can be sprayed as soon as it has reached the 3 to 4-leaf stage.
Carbyne	barban	Gulf	1 lb/gal EC	Selective wild oat herbicide for postemergence application in wheat, barely, sugar beets and peas. Timing of application critical for effective wild oat control.
Casoron	dichlobenil	Thompson Hayward	50% WP 4 & 10% Gran	Suggested for control of certain grasses and broadleaf weeds in fruit nurseries and established woody ornamentals and for around home-flower gardens, hedgerows, etc. Must be applied to a weed free surface.

Avadex	diallate	Monsanto	4 lb/gal EC 10% Gran	For control of wild oats in spring planted crops such as sugar beets, barley, corn, forage legumes and potatoes.
Avadex-BW Far-Go	triallate	Monsanto	4 lb/gal EC	Avadex BW or Far-Go is specifically cleared for wild oat control in barely and wheat only. Far-Go shows better crop tolerance than Avadex on these two crops. Must be incorporated immediately after application to insure success.
Avenge	difenzoquat	American Cyanamid	2 lb/gal EC	Used for control of wild oat in fall and spring seeded wheat and barely. Apply when wild oats are in the 3 to 5-leaf stage. It can be applied in tank-mix with MCPA amine or bromoxynil or 2, 4-D ester or amine for broadleaf weed control. When applying in more than 10 gpa spray, follow instructions relating to addition of surfactant.
Balan	benefin	Elanco	1.5 lb/ gal EC	Balan is recommended for weed control in alfalfa, alsike clover, birdsfoot trefoil, ladino, and red clover. Must be applied before seeding. Also used in established turf for control of undersirable annual grasses.
Banvel	dicamba	Velsicol	4 lb/gal EC 5% Gran	Broad spectrum selective herbicide. Used for selective broadleaf weed control in corn, small grains and grasses. Used to control weeds in lawns and turf. Control of perennial broadleaf weeds. Has clearance for use on pasture and rangeland up to 8 lb./A.
Betanal	phenmedipham	Nor-Am	1.3 lb/ gal EC	Selective postemergence herbicide for annual weed control in sugar beets. Pigweed resistant. Temperature sensitive. High temperatures beet damage - low temperature poor activity.
Betanex	desmedipham	Nor-Am	1.3 lb/ gal EC	Selective postemergence herbicide for annual weed control in sugar beets. More effective on pigweed than Betanal. Can be tank-mixed with Betanal for broader spectrum weed control.

Endothall	endothall	Pennwalt	0.52 to 2 lb/gal Sol. Conc. & 5 & 10% Gran	Endothall is used for weed control in alfalfa and sugar beets; has been used for pre-harvest drying of seed crops, as a general contact herbicide and as a aquatic herbicide.
Eptam	EPTC	Stauffer	7 lb/gal EC	A preplant soil incorporated herbicide for grass and certain broadleaf weeds in corn, legumes, sugar beets and many horticultural crops.
Eradicane	EPTC R-25788 antidote	Stauffer	7 lb/gal EC	Used similar to Eptam but has antidote included which provides greater crop safety for corn.
Fenac	fenac	Amchem	1.5 lb/gal EC	Perennial broadleaf control in non-cropped land.
Furloe	See Chloro IPC			
Hyvar X Hyvar XL	bromacil	DuPont	80% WP 2 lb/gal liquid	Used as a soil sterilant and for woody plant control. Hyvar X is a wettable powder. Hyvar XL is a water soluable liquid.
Igran	terbutryn	Ciba-Geigy	80% WP	A short residual S-triazine used for preemergence weed control in sorghum. Combine with AAtrex or Milogard for broader spectrum weed control.
IPC	See Chem Hoe			
Karmex	diuron	DuPont	80% WP	A substituted urea for selective annual weed control at light rates and as a soil sterilant at high rates.
Kerb	pronamide	Rohm + Haas	50% WP	A new herbicide preemergence and early postemergence weed control, especially annual and perennial grasses in alfalfa.
Knoxweed	Eptam+2,4-D	Stauffer	10-4% Gran	A combination of Eptam + 2, 4-D for preemergence annual weed control in corn. Do not use on sandy soils.

Chem Hoe	propham	Pittsburg Plate Glass	4 lb/gal Fl. 15% Gran	Chem Hoe was formerly IPC which belongs to the carbamate group of chemicals. Used for downy brome control in alfalfa.
Chloro IPC Furloe	chloropropham	Pittsburg Plate Glass	4 lb/gal EC 10% Gran	Suggested primarily for dodder control in alfalfa for Wyoming.
Cobex	dinitramine	U.S. Borax	2 lb/gal EC	New replant incorporated drybean herbicide similar to Trefla for grass control. Shorter residual life and narrower margin c crop safety than Treflan. A tank-mix with Eptam is commonl suggested.
Cytrol	See Amitrole-T			
Dacthal	DCPA	Thompson Hayward	50% WP 4 & 10% Gran	Used for preemergence control of annual grass and certai broadleaf weeds in turf, ornamental and horticultural crops Must apply to weed free surface.
Dowpon	dalapon	Dow	74% WP	Used for grass control in many broadleaf crops such as suga beets, corn, potatoes, legume seedlings and fruits.
Dinitro Weed Killer	dinoseb	Dow Niagara (FMC Corp.)	5 to 5.7 lb/ gal EC 1 to 3 lb/ gal salt	Several dinitro formulations are used as contact weed killers and for selective preemergence weed control. Dow General and Sinox General are soluble in most oils. These formulations are used mainly for non-selective general contact weed control. Examples: alfalfa in dormant season, orchard floor spray, pre-harvest desiccation of alfalfa and killing potato vines. Premerge and Sinox PE contain the alkanolamine salt. Used as a Dow Selective and Sinox W (ammonium salt) are used for postemergence selective weed control in certain crops including barley, oats, wheat, onions, seedling alfalfa and established alfalfa.
Dual	metolachlor	Ciba-Geigy	6 lb/gal EC	A new alachlor-like herbicide for weed control in corn grown for grain. Does not carry over in the soil to affect subsequent crops. Is cleared in combination with AAtrex.

Paraquat CL	paraquat	Chevron	2 lb/gal water soluble	General non-selective contact herbicide for several notill uses and for non-cropland, and as a pre-harvest application for desiccation of plants.
Polybor Chlorate		U.S. Borax	Gran	Is a non-selective herbicide for use where complete elimination of plant growth is desired. Is completely soluble in water and can be applied as a spray. Contains 73% disodium octoborate and 25% sodium chlorate. Has equivalent of 49% boron trioxide.
Pre Beta I	pebulate + diallate	Great Western Sugar Co.		A preplant incorporated herbicide for control of annual grasses and certain broadleaf weeds in sugar beets.
Pre Beta II	cycloate + diallate	Great Western Sugar Co.		
Pramitol	prometone	Ciba-Geigy	80% WP 5% pellet 1.97 lb/ gal. Liq.	A long lasting non-selective soil sterilant. The 25E formulation contains 1.97 lb. prometone per gal. Parmitol 5PS is a pelleted form containing 5% prometone 0.75% simazine, 40% sodium chlorate, and 50% sodium metaborate.
Preemerge	See Dinitro Weed Killer			
Princep	simazine	Ciba-Geigy	80% WP 4 lb/gal Fl. 4% gran	Simazine is used primarily as a soil sterilant but is also used for weed control in shelterbelts, deciduous fruits, established alfalfa, ornamentals and nursery plantings.
Prowl	pendimethalin	Amer. Cyanamid	3 lb/gal EC	Used preemergence on corn. Has been evaluated for weed control in drybeans, seedling alfalfa and potatoes.
Pyramin	pyrazon	BASF	75.5% WP	Used for preemergence broadleaf weed control in sugar beets. Often combined with other herbicides to increase spectrum of weed control.
Ramrod	propachlor	Monsanto Dow	65% WP 4 lb/gal Fl. and 20% gran	Preemergence herbicide for control of annual grasses in corn and sorghum.

Krovar I	bromacil diuron	DuPont	80% WP	Combination of 40% bromacil and 40% diuron. Intended for u in non-cropland areas. Do not use near desirable trees, alo walks, driveways or similar areas.
Kuron 2,4,5 TP	silvex	Dow Amchem	4 lb/gal EC	Similar to 2, 4, 5-T. Used to control chickweed in lawns a prickly pear cactus on rangelands.
Lasso	alachlor	Monsanto	4 lb/gal EC	Registered for preemergence use on corn, drybeans and pota es.
Lexone	metribuzin	DuPont	See Sencor	
Lorox	linuron	DuPont	50% WP	Selective herbicide for preemergence broadleaf weed control field corn, potatoes, and short-term vegetation control along rigation ditches.
MCPA Methoxone Chiptox Weedone	MCPA	Dow Rhodia Chipman Amchem	2+4 lb/gal EC and amine salts	Closely related to 2, 4-D but safer on oats, peas and flax.
Milogard	propazine	Ciba-Geigy	4 lb/gal liq. 80% WP	Used in preemergence weed control in sorghum. Often combi ed with AAtrex or Igran for improved weed control.
Monobar chlorate		U.S. Borax	Gran	Contains 68% sodium metaborate and 30% sodium chlora Has equivalent of 23.3% boron trioxide. Nonselective grass a broadleaf killer for use in parking lots, fence lines, highway a railroad sites, under asphalt, etc.
Modown	bifenox	Mobil	80% WP 2 lb/gal EC	A preemergence herbicide for the control of broadleaf and c tain grass weeds in corn and sorghum. Early injury observed corn.

Tolban	profluralin	Ciba-Geigy	4 lb/gal EC	Preplant incorporated herbicide for weed control in alfalfa (seedling), drybeans and sunflowers.
Tordon 22K	picloram	Dow	2 lb/gal	Tordon is suggested for control of deep-rooted perennial broadleaf weeds. Many grass species are tolerant to Tordon. Federal label only for non-cropland use only. However, Wyoming has a state label for use on rangelands for control of poisonous plants, woody plant species and herbaceous perennials. Persistent compound in the soil.
Tordon-212	(mixture of 1 lb/gal picolinic acid 2 lb/ gal 2,4-D)			Same use and restrictions as for Tordon 22K.
Tordon Beads	(2% granule material)			Same use and restrictions as for Tordon 22K.
Treflan	trifluralin	Elanco	4 lb/gal EC 5% Gran	Preplant incorporated herbicide for use in drybeans,alfalfa and a number of other crops including several horticultural crops. Is weak on weeds in the nightshade family.
Ureabor		DuPont	Conc. Gran	There are three formualtions of Ureabor which include Ureabor 31 and Ureabor 62. They contain different percentages of disodium tetraborate pentahydrate, disodium tetraborate decahydrate, monuron and 2, 3 6TBA. They are all non-selective soil sterilants.
Vapam VPM	metham	Stauffer DuPont	4 lb/gal liquid	A soil fumigant used to kill germinating seeds, rhizomes, tubers, roots, and stems of weeds in the soil. Often used as a preplanting treatment in areas that are to be planted or replanted with lawngrasses, seed beds, flowers, ornmentals, etc.

Ro-Neet	cycloate	Stauffer	6 lb/gal EC 10% gran	A preplant incorporated herbicide for control of annual grasses and certain broadleaf weeds in sugar beets.
Roundup	glyphosate	Monsanto	3 lb/gal EC	A postemergence non-selective translocated herbicide effective on many annual and perennial weeds, both grasses and broadleaf species. No soil residual. Late (fall) applications on several perennials appear to be most effective time application. Also used for renovation of lawns.
Sencor	metribuzin	Chemagro	50% WP 4 lb/gal	Preemergence or early postemergence weed control in potatoes. Recently received clearance for weed control in established alfalfa.
Silvex	See Kuron			
Sinbar	terbacil	DuPont	80% WP	Used for dormant season control of annual grass and broadleaf weeds in established alfalfa.
Spike	tebuthiuron	Elanco	80% WP	Total vegetation control product. Is resistant to leaching and lateral movement. New clearances include road shoulders where no vegetation is desired and under asphalt and concrete pavements.
Sutan	butylate + R-25788	Stauffer	6.7 lb/ gal EC 10% Gran	A preplant incorporated herbicide for the control of annual grass in corn. Sutan+ mixed with other herbicides such as AAtrex and Bladex control a broader spectrum of weeds.
Tandex	karbutilate	FMC	80% WP 4 and 10% Gran	For use on non-crop areas for non-selective broad spectrum weed control. Lateral movement is minimal. Railroad, highway, utility-rights-of-way, industrial sites.
TCA	TCA	Dow	90% SP 90% pellets	Grass killer for use on non-crop areas such as right-of-ways, fence rows, drainage ditch banks, airfields, etc.
T	pebulate	Stauffer	6 lb/ EC 10 Gran	Preplant incorporated herbicide for annual g ontrol in sugar beets.

CALIBRATING A SPRAYER

Too often, sprayers are not calibrated properly. This results in poor weed control or over application which injures crop plants. Correct application is one factor which the operator can control. It is essential that the; liquid applied per acre be known so that the proper amount of chemical can be included in the specified volume of liquid and so proper application can be made.

BOOM SPRAYERS

Step 1. Determine the effective boom width. This is the width of the spray pattern on the ground.

Step 2. Calculate the distance the sprayer must travel to cover one acre by dividing effective boom width into square feet per acre. The distance necessary to spray an acre usually takes too much time to measure. The common practice is to reduce the area sprayed to a fraction of an acre: 1/6, 1/4, etc.

Step 3. Fill the suppy tank to an easily determined point. Adjust the pressure (35 to 40 psi for most uses). Adjust the tractor speed to 3 to 4 mph (or whatever speed you plan to use in the field). It is best to make trial runs to adjust speed and pressure. Spray the measured distance.

Step 4. Carefully measure water required to refill the supply tank to the determined point. Make two or three calibration runs to be sure the sprayer is applying the same volume each time.

Step 5. Multiply the number of gallons required to fill the supply tank by the reciprocal of the fraction of an acre sprayed (the reciprocal of 1/6 is 6, 1/4 is 4, etc.) to obtain the sprayer rate in gallons per acre at the speed and pressure used.

Example: (sprayer with 20-foot boom)

Step A. 43,560 (sq ft/A) = 2,178 feet necessary to travel to cover one acre. 43,560 ÷ 20 = 2178. 1/4 of 2,178 = 544 feet to cover 1/4 acre.

Step B. 10 gallons of water required to refill supply tank.

Step C. 10 x 4 = 40 gallons per acre sprayed.

Step D. To each 40 gallons of water in supply tank, add the number of pints, quarts, gallons or pounds or chemical needed to obtain the recommended application rate.

HAND OR KNAPSACK SPRAYER

Step 1. Mark out one square rod (16½ ft. x 16½ ft.).

Step 2. Put two quarts of water in spray can.

Step 3. Pump sprayer to 35 to 40 pounds pressure if it has a pressure gauge. If not, count number of strokes used to pump up the spray can.

Step 4. Spray the square rod, walking the same speed you plan to use in the field or yard.

Step 5. Measure the water remaining in the spray can and subtract this from the original two quarts.

Step 6. Compute the rate of spray per acre by the following formula: Gallons per acare = amount sprayed out (in pints) x 20.

Example

You find you sprayed two pints to the square rod.

$$2 \times 20 = 40 \text{ gal/A}$$

You now know what rate of water you are applying per acre. But how much chemical do you add to each gallon of water?

If the application rate calls for one pound of 2,4-D per acre and you have a four pound per gallon active material, here is how you mix:

If we have four pounds active per gallon, there is one pound per quart. There are 946 cc per quart and 160 square rods per acre.

946 ÷ 160 = 5.9 cc required to equal one pound per acre. This amount of chemical would be added to each quart of water.

HIGH PRESSURE, SINGLE NOZZLE SPRAYER

Step 1. Measure an area 16½ x 16½ feet (one square rod).

Step 2. Set sprayer at desired pressure and spray pattern.

Step 3. Determine the time (in seconds) it takes to thoroughly spray the measured area.

Step 4. Spray into a container for the same amount of time required to spray the square rod.

Step 5. Determine the amount of spray in quarts and multiply by 160 (160 sq rd/A) and divide by 4 (4 qt/gal).

Example

4 quarts recovered; 4 x 160 = 640 qt/A
640 ÷ 4 = (160 gal/A)

Velpar	hexazione	DuPont	90% SP	Has both contact and soil residual activity. Suggested for general vegetation control on industrial sites, railroad rights-of-way, ditchbanks and similar areas.
Weedazol	See Amitrol			
Weedmaster	dicamba + 2,4-D	Velsicol	1 lb/gal dicamba + 2 lb/gal 2,4-D	For control of annual and perennial broadleaf weeds on pasture and rangeland grasses, and non-cropland areas such as fencerows, roadways, wastelands and around farm buildings.
2,4-D (many trade names)	2,4-D	Dow Chipman Hercules Diam-Sham	Acid, salts, amines, esters	2, 4-D is widely used, foliar applied, translocated herbicide for broadleaf weed control in cereal crops, turf, pastures, rangeland and non-cropland.
2,4,5-T (many trade names)	2,4,5-T	Dow	4 lb/gal and amine salts	2, 4, 5-T is similar to 2, 4-D but is usually more effective on certain woody plants than 2, 4-D. Is mixed with 2, 4-D and marketed as "Brush Killer".
2,4,5-TP	See Kuron			
4(2,4-DB) Butoxone Butyrac	2,4-DB	Rhodia-Chipman	2 lb/gal EC and salts	Selective postemergence, translocated herbicide for broadleaf weed control in legumes. Susceptible plants are able to oxidize 2, 4-DB into 2, 4-D. Legume plants do not possess the enzymes or ability to oxidize 2, 4-DB therefore selectivity results.

CONVERSION TABLE FOR PESTICIDES ON AN ACRE BASIS

Formulation	Amount of Chemical Recommended in Pounds Active Material Per Acre								
	1/8	1/4	1/2	3/4	1	1½	2	2½	3
10%-12% (Contains 1 lb active/gal)	1 pt	1 qt	2 qt	3 qt	1 gal	1½ gal	2 gal	2½ gal	3 gal
15%-20% (Contains 2 lb active/gal)	⅓ qt	⅔qt	1⅓ qt	2 qt	2⅔ qt	1 ga	1⅓ gal	1⅔ gal	2 gal
25% (Contains 2 lb active/gal)	½ pt	1 pt	1 qt	3 pt	2 qt	3 qt	1 gal	5 qt	1½ ga
45%-50% (Contains 4 lb active/gal)	¼ pt	½ pt	1 pt	1½ pt	1 qt	3 pt	2 qt	5 pt	3 qt
60%-65% (Contains 6 lb ctive/gal)	1/6 pt	⅓ pt	⅔ pt	1 pt	1⅓ pt	1 qt	2⅔ pt	3⅓ pt	2 qt
5% Wettable Powder	2½ lb	5 lb	10 lb	15 lb	20 lb	30 lb	40 lb	50lb	60 .c
25% Wettable Powder	½ lb	1 lb	2 lb	3 lb	4 lb	6 lb	8 lb	10 lb	12 lb
40% Wettable Powder	5 oz	10 oz	1¼ lb	1-7/8 lb	2½ lb	3¾ lb	5 lb	6¼ lb	7½ lb
75% Wettable Powder	1/6 lb	⅓ lb	⅔ lb	1 lb	1⅓ lb	2 lb	2⅔ lb	3⅓ lb	4 lb
80% Wettable Powder	2½ oz	5 oz	5/8 lb	15/16 lb	1¼ lb	1-7/8 lb	2½ lb	3-1/8 lb	3¾ lb

Example: To apply 1 lb/A of the 4 lb/gal material it would require 1 qt of this formulation for each acre sprayed.

CONVERSION TABLES

The following tables can be used to determine the amount of pesticide, liquid or dry formulation, needed per unit area to give the rate recommended for effective control.

LIQUID CONVERSION FACTORS

1 gallon = 4 quarts or 8 pints or 3785 cc or 128 fluid ounces

1 quart = 2 pints or 4 cups or 946 cc or 32 fluid ounces

1 pint = 2 cups or 473 cc or 16 fluid ounces

1 cup = 16 tablespoons or 236.5 cc or 8 fluid ounces

1 tablespoon = 3 teaspoons or 15 cc or ½ fluid ounces

WEIGHT CONVERSION FACTORS

1 pound = 16 ounces, or 454 grams

1 ounce = 28.4 grams

cc = cubic centimeter

PLOT SIZE FACTORS

1 rod = 16.5 feet

1 square rod = 16.5 x 16.5 feet or 272 square feet

1 acre = 160 square rods

1 acre = 43,560 square feet

APPLICATION FACTORS

1 cup per square rod = 10 gallons per acre

1 pint per square rod = 20 gallons per acre

1 quart per square rod = 40 gallons per acre

1 gallon per square rod = 160 gallons per acre

CONVERSION TABLE
METRIC CONVERSIONS

Symbol	When you know	Multiply by	To Find	Symbol
lb	pounds	0.45	kilograms	kg
pt	pints	0.47	liters	L
qt	quarts	0.95	liters	L
oz	ounces	30	milliliter	mL
acre	acres	0.4	hectares	ha
ha	hectares	2.5	acres	

CONVERSION TABLE FOR LIQUID FORMULATIONS

Per 1000 square feet

Rate desired lb./A	Concentration of Active Ingredients in Formulation											
	1		2		2.5		3		4		5		6	
	(cc or tablespoon (tbsp) of formulation per 1000 square feet)											
	c.c.	tbsp.	c.c.	tbsp.	c.c.	tbsp.	c.c.	tbsp.	c.c.	tbsp.	c.c.	tbsp.	c.c.	tbsp.
1	87	(5¼)	43	(3)	35	(2-⅓)	29	(2)	22	(1½)	17	(1¼)	14	(1)
2	173	(11½)	87	(5¼)	69	(4⅔)	58	(3¾)	43	(3)	35	(2⅓)	29	(2)
3	260	(18⅓)	130	(8⅔)	104	(7)	87	(5¾)	65	(4⅓)	52	(3½)	43	(3)
4	348	(23¼)	174	(11⅔)	139	(9¼)	116	(7¾)	87	(5¾)	70	(4⅔)	58	(3¾)
5	434	(29)	217	(14½)	174	(11⅔)	145	(9⅔)	109*	(7¼)	87	(5¾)	72	(4¾)
6	521	(34¾)	260	(17⅓)	208	(13¾)	174	(11⅔)	130	(8⅔)	104	(7)	87	(5¾)
7	608	(40½)	304	(20¼)	254	(16¼)	203	(13½)	152	(10)	122	(8)	101	(6¾)
8	694	(46¼)	347	(23)	278	(18½)	231	(15½)	174	(11⅔)	139	(9¼)	116	(7¾)
9	781	(52)	390	(26)	312	(20¾)	260	(17⅓)	195	(13)	156	(10½)	130	(8⅔)
10	867	(57¾)	433	(28¾)	347	(23)	289	(19¼)	217	(14½)	173	(11½)	144	(9⅔)

*Example: To spray a 1000 sq ft area at the rate of 4 lb/A active ingredient using a formulation containing 4 lb/gal active ingredient, use 109 cc or 7¼ tablespoons of the 4 lb/gal formulation in the amount of carrier your application equipment is applying per unit area (1000 sq ft).

A5-30

98

CONVERSION TABLE FOR DRY FORMULATIONS

Per 1000 square feet

Rate desired lb/A	Concentration of Active Ingredients in Formulation												
	100%	90%	80%	75%	70%	60%	50%	40%	30%	25%	20%	10%	5%
	(Grams of formulation per 1000 square feet)												
1	10	12	13	14	15	17	21	26	35	42	52	104	208
2	21	23	26	28	30	35	42	52	69	83	104	208	417
3	31	35	39	42	45	52	63	78	104	125	156	312	625
4	42	46	52	56	60	69	83*	104	139	167	208	417	833
5	52	58	65	69	74	87	104	130	174	208	260	521	1040
6	63	69	78	83	89	104	125	156	208	250	312	625	1250
7	73	81	91	97	104	121	146	182	243	292	364	729	1460
8	83	93	104	111	119	139	167	208	278	333	417	833	167
9	94	104	117	125	134	156	187	234	312	375	469	937	187
10	104	116	130	139	149	174	208	260	347	417	521	1040	2080

***Example:** To treat a 1000 sq ft area at the rate of 4 lb/A active ingredient using a formulation containing 50% active ingredient, use 83 grams of the 50% formulation in the amount of carrier your application equipment is applying per unit area (100 sq ft).

APPENDIX 6

COLLECTING, HANDLING AND RELEASING
RHINOCYLLUS CONICUS, A BIOLOGICAL CONTROL AGENT OF MUSK THISTLE

APPENDIX 6

COLLECTING, HANDLING AND RELEASING *RHINOCYLLUS CONICUS*, A BIOLOGICAL CONTROL AGENT OF MUSK THISTLE[1]

MUSK THISTLE LIFE CYCLE

Musk thistle is a common name for several species of plants of the large headed *Carduus nutans* L. group, including *C. macrocephalus* Desf., *C. nutans* L., and *C. thoermeri* Weinmann. These species are similar in appearance, have similar life cycles, and respond alike to *R. conicus*. Musk thistle, as such, was introduced into the United States over 100 years ago, and has increased unchecked until it now can be found in 12% of the counties of the United States, being a serious problem in many of these. It inhabits all types of land except deserts, dense forests, high mountains, and newly cultivated lands.

Reproduction is totally by seeds which are produced from June and July until death of the plant from natural causes. Only 2% of these are attached to the plumeless pappus and are born on the wind; the remainder fall to the ground in close proximity to the parent plant and are distributed by birds, small animals, running water, etc.

Musk thistle plants can act either as a biennial, a winter annual, or an annual. Seeds can germinate after a 6-8 week resting period, or can remain dormant in the soil for several years. About 69% germinate during the first year, 20% the second, and the remaining 11% may germinate later.

Seedlings that germinate in the fall attain a rosette stage before winter. In the spring, diameter of the rosette may reach from one to three feet before the plant bolts. Although each plant typically sends up one main

---

[1] Also called "nodding thistle" in some countries.

stem, damage to the terminal meristem, either mechanically or by frost, will generally cause groups of stems to develop, usually in multiples of five. Plants attain heights from 1 to 8 feet, and sometimes exhibit considerable variation in height, form, and color between years, locations, and individual plants.

Flowers of musk thistle are reddish purple. Each terminal flower produces about 1,000 seeds; each lateral bud produces smaller flowers with fewer seeds, averaging about 840 seeds per year. In the Gallatin Valley, flowering continue until the plants are killed by adverse weather conditions.

LIFE HISTORY AND HABITS OF RHINOCYLLUS CONICUS

Rhinocyllus conicus weevils overwinter as adults. In the spring, they congregate on musk thistle plants prior to and during the bolting stage. This occurs about mid-to-late-May in the Gallatin Valley of Montana. Congregating adults feed, mate, and deposit eggs. Each female will produce from 100-150 eggs which are laid individually or in clusters of 2-5, generally on the bracts of the bud. The eggs are then covered with masticated plant material which becomes tan and appears as "warts" on the plant.

As the primary (terminal) buds become saturated with eggs, the weevils begin laying eggs on the stems and on the secondary (lateral) buds. Cool spring weather and a dense weevil population tend to extend the egg laying period, which seems to result in an increase in the number of eggs being deposited on the lateral buds, and on the buds of certain other thistle species.

Table 1. Thistle species which are hosts for *Rhinocyllus conicus*

Common Name	Scientific Name	Found in U.S.
Plumeless thistle	*Carduus acanthoides* L.	Yes
Welted thistle Curled thistle	*C. crispus* L.	Yes
(Unknown)	*C. nigrescens*	No
Musk thistle	*C. macrocephalus* Desf.	Yes
Nodding thistle	*C. nutans* L.	Yes
	C. theormeri Weinmann	Yes
Great marsh thistle	*C. personata* (l.) Jacp.	No
Italian thistle	*C. pycnocephalus* L.	Yes
(Unknown)	*C. sanctae* balme	No
Slender-flower thistle	*C. tenuiflorus* Curtis	Yes
Canada thistle Creeping thistle	*Cirsium arvense* (L.) Scop.	Yes
Wavyleaf thistle Wavy-leaved thistle	*C. undulatum* (Nutt.) Spreng.	Yes
Bull thistle	*C. vulgare* (Savi) Tenore	Yes
Milk thistle	*Silybum marianum* L.	Yes
Scotch thistle	*Onopodrum acanthium* L.	Yes

The eggs hatch after 6-8 days and the cream colored larvae burrow through the bracts into the future seed producing tissue of the bud known as the receptacle. Here they develop for the next 25-40 days, feeding on the receptacle and maturing seed tissue, thereby creating individual cells. The feeding appears to stimulate the plant to concentrate nutrients and tissue in the affected area similar to the effect created by gall-producing insects. The mature larva eventually coats the inner cell wall with faeces and masticated plant material to produce a hard, protective chamber for the 8-14 day pupal stage.

Larvae that tunnel into stems of musk thistle do not construct cells. Nevertheless, these larvae usually remain in the immediate vicinity where they initially began to feed.

Adult weevils emerge from their pupal cases but remain within their cells for 2 weeks or longer, during which time their color turns from a cream or reddish tan to almost black. The body hair is a patchy mixture of black and yellow, which gives the appearance that the weevils are covered with pollen. Although size is variable, most larger weevils measure no more than about 1/4 inch long.

Weevils chew their way out of the seed heads through the face of the receptacle while those in the stems exit through several small openings chewed near the attachment of the seed head. Adults can occasionally be seed flying about on warm fall days. It is not known where R. conicus overwinters.

SELECTING A RELEASE SITE

Several factors are important to the selection of sites for establishing R. conicus. A release of 500 adult weevils (approximately one-half of which

are female) has the potential to produce about 37,500 eggs the first year. Therefore, to achieve a population of 30 or fewer eggs per plant, the release area should contain at least 1,250 plants to avoid overcrowding. Actually more plants are desirable to reduce the number of eggs per plant and increase their chances for survival. Since R. conicus weevils are good fliers, a continuous link of plants between plant concentrations is not needed for expansion of the colony.

The most vulnerable period of the weevil's life is the larval stage within the developing seed head. Severe moisture stress to the plant will cause death of the larvae. Therefore, release sites should have good soil moisture and high water holding capacity. Proximity to irrigation water is desirable so that if infested plants show signs of stress from lack of moisture, they can be watered. Although watering the thistless seems contrary to the idea of controlling them, it is necessary during the early years following release to take steps to encourage reproduction and enhance survival of the weevils until they are established and have distributed themselves throughout the area.

Releases should be in areas that will not be grazed during the weevil's egg-laying period. Although livestock generally will not feed on musk thistle, their presence causes the weevils to leave the area.

The release field should not be mowed or sprayed for at least 2 years, with longer periods being advisable. Cut thistles will dry in a few days and all weevils in the plant will be killed. Although spraying is not recommended, it does allow much higher survival of the weevil than mowing.

COLLECTIONS

Before planning any collections, check with your State Department of Agriculture concerning regulations and restrictions on the importation and/or movement of insects within your state, and whether a permit is required. In some cases, your weed bureau or cooperative extension agent can provide this information. Generally these agencies like to be kept informed, and are often willing to work with you on this type of project.

Weevils for release are best collected as adults in the spring as they gather on the plants and begin to mate. In Montana, this begins about mid-to late-May, as the thistles are beginning to bolt, and continues for 3-8 weeks. Some collectors have made releases in late summer by transferring infested mature seed heads to new locations. However, in Virginia, it has been shown that spring collection and release was 25 times more effective than summer collection and release of weevil in the seed heads. Spring releases place gravid females in the immediate vicinity of the thistle plant. In contrast, weevil of the late summer releases must survive the relocation (dessication within the seed head may be a problem), emerge, disperse prior to winter, survive the winter, and find host plants (only a percentage return to the point of release) and mates before egg laying can occur.

Materials needed for collecting consist of a pair of thick leather gloves, a knife, and some plastic garbage bags. The collector closes the rosette or bolting portion of the plant by bringing the outer leaves up and together, thus trapping the weevils inside. The plant is then cut off, and is shaken and rubbed inside the garbage bag to dislodge the weevils.

For convenience, the bag can be tied to the collector's belt.

The collection must be sorted to assure a supply of R. conicus which is free from ants, other insects, and contaminants. A simple but primitive method is to pour 30-50 weevils from the garbage bag onto a stiff mat and, with the aid of a pocket knife, flip or "putt" the adult weevils into a glass tube (about 3/4 to inch diameter by 1 1/2 inch deep) taped to a dowel. When the glass tube contains ten weevils, it can be emptied into a larger holding container, and a running count of the collection can be maintained.

A more advanced method uses an aspirator and a hand counter to pick up and record the weevils. Tables, chairs, and vacuum pumps make the sorting more comfortable.

When 500 adult weevils have been collected, place them, along with an insect-free thistle bud or leaves, in a cardboard carton that can be sealed tightly enough to prevent escape. Plastic cartons are not recommended. The cartons can then be stored and transported for up to a week in an insulated chest that is kept cool (but not frozen) with ice packs. It is advisable to release insects as soon as possible after collection to enable them to deposit most of their eggs at the release site rather than in the carton.

A word of caution; make sure that all weevils which are to be transferred to the new locations are Rhinocyllus conicus. Several other species occasionally occur on Musk thistle, such as the alfalfa weevil and the plum curculionid. However, these are of low incidence and differ conspicuously in appearance from R. conicus. If a question exists, have all weevils checked by an experienced entomologist before they are released.

RELEASES

Each release should contain 300-500 adult weevils, with 500 being preferred. The larger the release, the faster the population will increase. Just sprinkle the insects over the Musk thistle plants at the rate of about 5-10 per plant. Their normal movement from plant to plant will provide adequate dispersal.

MONITORING

An important aspect of the release is to be able to see and to show what results are obtained. Therefore, several references should be established during the year of release. Photographs of the release sites in Musk thistle fields, taken each year from the same spot when the thistles are in bloom, and which include a reference landmark (i.e., trees, building) in the background, will give visual evidence of the year by year fluctuation and/or decline of the thistle population.

Actual plant counts should also be recorded at about the same time each year, generally in early spring or following bolting. A minimum of 20 random square-yard quadrats along a transect through the site is recommended. It should be decided ahead of time if seedlings, bolted plants, or all plants in each quadrat are to be counted. Either method will give an index of the Musk thistle population trend. Bolted plants provide an indication of seed production two years ago; seedlings of one year ago.

Extensive counts of R. conicus eggs should not be attempted for several years following release because accuracy requires that flower bracts be removed. This could greatly reduce survival of larvae. However, cell counts can be made after the normal heads have released their seed. At that time, infested seed heads appear lumpy, pappus still adhere to the

protruding cells, and emergence holes are evident. The protruding cells are especially conspicuous in cross-section. To determine the number of weevils that the seed head supported, one can chip away the walls of the cells and count each cell as it becomes exposed. Mortality can also be estimated by counting dead weevils and comparing that to the number of cells.

Close monitoring will also expose adversities which may threaten a successful establishment, such as plants beginning to suffer moisture deficiency, presence of livestock, or change of field conditions. In some cases, these adverse conditions can be overcome. Remember, from beginning to end, be aware and care. Proper selection of release sites, careful collections, prompt transfers and releases, and careful monitoring of the release site will help to insure that time, effort, and money are not wasted.

APPENDIX 7

WYOMING WEED AND PEST CONTROL ACT OF 1973,
AS AMENDED 1979, PUBLIC LAW 90-583

INDEX

Title II, Chapter 5

Section		Page
11-5-101	Citation and purpose	1
11-5-102	Definitions	1
11-5-103	Composition of districts	3
11-5-104	District board of directors; appointments; terms; vacancies; compensation and expenses	3
11-5-105	Duties; powers; supervisor compensation	4
11-5-106	Board of certification; duties	5
11-5-107	Purchase and sale of pesticides and equipment	5
11-5-108	Rates and application of pesticides; payment by landowner	5
11-5-109	Inspection of land; remedial requirements; cost to landowner	6
11-5-110	Appraisal of damage to landowner; hearing	7
11-5-111	Tax levied on property in district; maximum amount; weed and pest control fund	7
11-5-112	Repealed by Law 1979, ch 135	7
11-5-113	Allocation of funds; formula; special funding	7
11-5-114	Allocated funds; procedure to disburse	7
11-5-115	Program in cities and towns authorized; funding; use of monies	7
11-5-116	Quarantine by Commissioner; request by district	8
11-5-117	Criminal provision; penalty	9
11-5-118	Inspection for contamination	9
11-5-119	Rules and regulations	9
11-5-201	Leafy Spurge Control Program	10

APPENDIX 7

WYOMING WEED & PEST CONTROL ACT OF 1973

TITLE 11, CHAPTER 5

W.S. 11-5-102 (a)

(x) "Designated list" means the list of weeds and pests from time to time designated by joint resolution of the board and the Wyoming Weed and Pest Council;

(xi) Designated Noxious Weeds:

(1) Field bindweed (convolvulus arvensis)
(2) Canada thistle (circium arvense)
(3) Leafy spurge (euphorbia esula)
(4) Perennial sowthistle (sonchus arvensis)
(5) Quackgrass (agropyron repens)
(6) Hoary cress (whitetop) (cardaria draba and cardaria pubescens)
(7) Perennial pepperweed (giant whitetop) (lepidium latifolium)
(8) Ox-eye daisy (chrysanthemum leucanthemum)
(9) Skeletonleaf bursage (franseria discolor)
(10) Russian knapweed (centaurea repens)
(11) Yellow toadflax (linaria vulgaris)
(12) Dalmation toadflax (linaria dalmatica)
(13) Scotch thistle (onopordum acanthium)
(14) Musk thistle (carduus nutans)
(15) Common burdock (arctium minus)
(16) Plumeless thistle (carduus acanthoides)
(17) Dyers Woad (isatis tinctoria L)
(18) Hounds Tongue (cynoglossum officinale L.)

(xii) Designated Pests

(1) Grasshoppers
(2) Mormon crickets
(3) Prairie dogs
(4) Ground squirrels
(5) Mountain pine beetle
(6) Beet Leafhopper

CHAPTER 5
Weed and Pest Control
ARTICLE 1
IN GENERAL

11-5-101. Citation and purpose. (a) This act may be cited as the "Wyoming Weed and Pest Control Act of 1973".

(b) The purpose of this act is controlling designated weeds and pests.

11-5-102. Definitions. (a) As used in this act:

(i) "Agricultural pesticide" means any material used to control or eradicate weeds or pests;

(ii) "Authorized dealer" means a resident of Wyoming who sells, retails, wholesales, distributes, offers or exposes for sale, exchanges, barters or gives away any agricultural pesticide within this state;

(iii) "Board" means the Wyoming board of agriculture established by authority of W.S. 11-2-101 through 11-2-104;

(iv) "Commissioner" means commissioner of agriculture for the state of Wyoming or his designated agent;

(v) "Control" means the process of containing and limiting weed and pest infestations;

(vi) "County commissioners" means the board of county commissioners of a county within which a district is located;

(vii) "Declared pest" means any animal or insect which the board and the Wyoming weed and pest council have found, either by virtue of its direct effect, or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district;

(viii) "Declared weed" means any plant which the board and the Wyoming weed and pest council have found, either by virtue of its direct effect, or as a carrier of disease or parasites, to be detrimental to the general welfare of persons residing within a district;

(ix) "Department" means the state department of agriculture;

(x) "Designated list" means the list of weeds and pests from time to time designated by joint resolution of the board and the Wyoming weed and pest council;

(xi) "Designated noxious weeds" means the weeds,

seeds or other plant parts that are considered detrimental, destructive, injurious or poisonous, either by virtue of their direct effect or as carriers of diseases or parasites that exist within this state, and are on the designated list;

(xii) "Designated pests" means animals or insects which are on the designated list considered detrimental to the general welfare of the state;

(xiii) "Director" means the director, division of plant industry, state department of agriculture, or his designated agent;

(xiv) "District" means any county weed and pest control district;

(xv) "District board" means the board of directors of a district having jurisdiction within the boundaries of the district it represents;

(xvi) "District board member area" means a geographical area within a district from which a member of the board of the district is appointed;

(xvii) "Division" means division of plant industry, state department of agriculture;

(xviii) "Farm products" means all crops, crop products, plants or portions thereof, but shall not mean livestock;

(xix) "Infested farm products" means farm products which contain injurious insects, pests, weed seed, poisonous or injurious plants or any injurious portion thereof, or plant diseases;

(xx) "Landowner" means any owner or lessee of state, municipal or private land, and includes an owner of any easement, right-of-way or estate in the land. Federal landowner means the federal agency having jurisdiction over any lands affected by this act;

(xxi) "Supervisor" means the person appointed or employed by the district board for the purpose of carrying out this act within a district;

(xxii) "Wyoming weed and pest council" means the state council composed of one (1) representative of each district as authorized in writing by that board of directors. The commissioner of agriculture or his designated representative shall serve ex officio;

(xxiii) "This act" means W.S. 11-5-101 through 11-5-119.

11-5-103. Composition of districts. All land within the boundaries of Wyoming including all federal, state, private and municipally owned lands, is hereby included in weed and pest control districts within the county in which the land is located, with the boundaries of the district being the same as the boundaries of the county. Each district shall be known as the ". . . . County Weed and Pest Control District, State of Wyoming."

11-5-104. District board of directors; appointment; terms; vacancies; compensation and expenses. (a) The county commissioners of each district shall hold a public meeting for appointing a district board of directors for the district. Prior to the meeting the county commissioners shall establish the number of members of the district board and shall establish district board member areas. The county commissioners may seek the advice and counsel of the members of the former district board for the establishment of district board member areas. Each district board member area shall be contiguous. Notice of the meeting shall be advertised in the official newspaper of the county at least two (2) times before the date of the meeting, with the last publication being at least ten (10) days prior to the date of the meeting. The notice shall solicit nominations for directors by petition signed by at least ten (10) landowners to be submitted at least five (5) days before the date of the meeting.

(b) From the nominations submitted the county commissioners shall appoint the district board which shall consist of five (5) or seven (7) directors. Directors shall serve for a term of four (4) years or until their successors are appointed and qualified.

(c) Any qualified elector in the district board member area he is appointed to represent is eligible to hold the office of director.

(d) All district board members shall be appointed by the county commissioners at their first regular meeting in January of each year from among nominations submitted by petition in the manner set forth in subsection (a) of this section. In districts encompassing cities or towns with a population of five thousand (5,000) or more, one (1) district board member shall be appointed from within the limits of a city or town. A district board member shall assume office at the first regular meeting of the district board following appointment.

(e) The county commissioners shall remove a director for repeated unexcused failure to attend meetings or for refusal or incapacity to act as a district board member.

(f) When a vacancy occurs on a district board the county commissioners shall, at the next regular meeting, appoint an

individual who possesses the necessary qualifications as a district board member to fill the unexpired term.

(g) At the first regular meeting in February the district board shall elect from its members a chairman and a vice-chairman, and appoint a secretary and a treasurer. The positions of secretary and treasurer need not be members of the district board. The treasurer shall furnish a surety bond to the district before entering upon the duties of office in an amount to be set by the district board but not less than three thousand dollars ($3,000.00).

(h) The members of the district board shall serve without pay, but are entitled to reimbursement for actual and necessary expenses and a mileage allowance at the rate as established for state employees.

11-5-105. Duties; powers; supervisor compensation. (a) The district board shall:

(i) Implement and pursue an effective program for the control of designated weeds and pests;

(ii) Fix the time and place of regular meetings, which shall occur at least once each month and shall be open to the public;

(iii) Keep minutes of all meetings and a complete record of all official acts, including all warrants issued against monies belonging to the district, which are open for public inspection during regular office hours;

(iv) Employ certified supervisors and if certified personnel are not available, employ an acting supervisor who shall become certified within twenty-four (24) months from the initial date of employment;

(v) Make at least one (1) annual inspection to determine the progress of weed and pest activities within a district;

(vi) Obtain competitive bids for any purchase costing more than one thousand five hundred dollars ($1,500.00);

(vii) Control and disburse all monies received from any source;

(viii) Render technical assistance to any city or town with a population of five thousand (5,000) or more which establishes a program as provided in W.S. 11-5-115.

(b) The district board of each district may:

(i) Sue and be sued;

(ii) Employ personnel and determine duties and conditions of employment;

(iii) Coordinate activities with the department and enter into cooperative agreements with other agencies;

(iv) Secure and maintain bond or liability insurance, when deemed feasible by the district board;

(v) Submit to the department reports required by the board;

(vi) Participate in programs for the control of declared weeds and declared pests not included on the designated list. Such programs do not qualify for cost-sharing from the department.

(c) The supervisor shall receive a salary and expenses as approved by the district board.

11-5-106. Board of certification; duties. A board of certification is established consisting of the director, a University of Wyoming weed or pest specialist appointed by the dean of the college of agriculture, two (2) certified supervisors and a district board member appointed by the Wyoming weed and pest council. The board of certification shall promulgate rules and requirements for certification of supervisors and shall certify all personnel meeting the established requirements. All inspectors certified as of February 10, 1973 are deemed certified supervisors without any further actions of the board of certification.

11-5-107. Purchase and sale of pesticides and equipment. (a) The district board may purchase from authorized dealers such quantities of agricultural pesticides and equipment as are necessary, and hire labor to carry out the provisions of this act. Warrants in payment shall be drawn on the weed and pest control fund.

(b) The district board may sell agricultural pesticides which have been registered with the department for weed and pest control.

(c) In the case of delinquent indebtedness under this section the district board may seek a judgment from the district court for the indebtedness, reasonable attorneys' fees and costs. The judgment shall be enforced as provided by law.

11-5-108. Rates and application of pesticides; payment by landowner. The district board may establish rates and engage in the application of agricultural pesticides for weed and pest control. The district board may cost share in the agricultural

pesticides, and the landowner shall pay the full cost of the application. If services provided are not paid for by the landowner for whom rendered, such indebtedness may be collected as provided by W.S. 11-5-107(c).

11-5-109. Inspection of land; remedial requirements; cost to landowner. (a) Whenever the district board has probable cause to believe that there exists land infested by weeds or pests which are liable to spread and contribute to the injury or detriment of others, it shall make or have made an investigation of the suspected premises through the use of lawful entry procedures. The designated representative of the district board, after giving the landowner written notice, may go upon premises within the district, through the use of lawful entry procedures, without interference or obstruction for purposes of making a reasonable investigation of the infested area. Notice is deemed to have been given if it is deposited in a United States post office by certified mail with sufficient postage, addressed to the last known address of the landowner at least five (5) days before entry.

(b) If the suspected area is found to be infested, the district board, by resolution adopted by two-thirds (2/3) of its members, shall confirm such fact. The district board may set forth minimum remedial requirements for control of the infested area.

(c) The district board shall deliver, by certified mail, to the address of the landowner appearing on the most recent tax roles of the district:

(i) A copy of the resolution;

(ii) A statement of the cost of fulfilling the requirements; and

(iii) A request that the requirements contained in the resolution be carried out at the owner's expense within a designated period of time or on a cooperative basis.

(d) At the request of the landowner, the district board shall hold a hearing in accordance with the Wyoming Administrative Procedure Act.

(e) A landowner who is responsible for an infestation and fails or refuses to perform the remedial requirements for the control of the weed or pest on the infested area within the time designated may be fined not more than fifty dollars ($50.00) per day for each day of violation and not more than a total of two thousand five hundred dollars ($2,500.00) per year as determined by the court. Any person accused under this act is entitled to a trial by jury. The accumulated fines under this section are a lien against the property of the landowner from the day notice is

delivered to the landowner by the district board. All fines shall be deposited with the county treasurer and credited to the county school fund.

11-5-110. Appraisal of damage to landowner; hearing. When the district board determines by resolution that the landowner's property has been damaged as a result of carrying out its requirements, the district board shall by resolution appoint three (3) disinterested freeholders within the district to appraise the amount of damage, upon which the district shall forthwith compensate the landowner. The landowner may file a claim for damages and is entitled to a hearing relative to the amount of damages pursuant to the Wyoming Administrative Procedure Act.

11-5-111. Tax levied on property in district; maximum amount; weed and pest control fund. The county commissioners shall annually levy a tax to carry out this act. The tax shall be levied upon all property in the district and shall not exceed one (1) mill on each one dollar ($1.00) of assessed valuation. The tax is not part of the general county or city mill levies. All taxes levied and collected shall be remitted to the district for a separate fund to be known as the weed and pest control fund, which shall be used only to carry out this act.

11-5-112. Repealed by Laws 1979, ch. 135.

11-5-113. Allocation of funds; formula; special funding. (a) An allocation committee composed of the commissioner, three (3) members appointed by the Wyoming weed and pest council and one (1) member of the board shall allocate the funds of any legislative appropriation to the district boards pursuant to a formula adopted by the committee. No district board shall receive an amount in excess of one-third (1/3) of its actual expenditures from any appropriation, unless the appropriation provides assistance in control to a district board under subsection (b).

(b) If the district board determines a weed or pest is seriously endangering areas of a district or the state, assistance in control may be provided by legislative appropriation for this purpose, and the allocation committee shall allocate the appropriation accordingly, and the allocation committee and each affected district board shall be responsible for insuring that the funds are properly expended.

11-5-114. Allocated funds; procedure to disburse. A request for allocated funds pursuant to W.S. 11-5-113 shall be initiated by the district board by submitting a voucher and documentation. Upon the approval of the voucher by the allocation committee, payment shall be made by the state auditor out of funds provided for control of weeds and pests.

11-5-115. Program in cities and towns authorized; funding; use of monies. (a) The governing body of any city or town with a population of five thousand (5,000) or more may establish and administer a program for the control of weeds and pests within the jurisdictional limits of the city or town. If such a program

is not established, the district board shall administer a program for the city or town.

(b) A district having a city or town with a population of five thousand (5,000) or more which establishes a program shall, within thirty (30) days after receipt of any funds collected pursuant to W.S. 11-5-111, transfer eighty-five percent (85%) of the funds attributed to the property within the corporate limits of the city or town to the governing body of the city or town, retaining fifteen percent (15%) of the funds for administration of the district and for technical assistance rendered to the city or town by the district board.

(c) Monies received by the cities from the district may be used in any phase of weed and pest control as determined by the governing body of the city or town. The control program shall include work on designated weeds and pests as determined by the district board.

(d) The governing body of a city or town which establishes a control program may petition the district board for special assistance and funding authorized by W.S. 11-5-113 and 11-5-114.

11-5-116. Quarantine by commissioner; request by district. (a) Whenever the commissioner, the district board or their agents find any section of the state to be infested with insects, pests, poisonous or injurious plants or plant diseases, and it is established that farm products from that section are liable to spread the insects, pests, poisonous or injurious plants or plant diseases into other sections to the injury of others, the commissioner shall without unnecessary delay, declare a quarantine against such section to prevent the transfer of farm products from the quarantined area. When it is ascertained that insects, pests, weed seed, poisonous or injurious plants or plant diseases are likely to be introduced into Wyoming by the importation of farm products, domestic animals or other objects, the commissioner shall declare a quarantine against the importation of such farm products.

(b) A district may initiate a district-wide quarantine by one (1) of the following procedures:

(i) A district may request in writing that the commissioner declare a district-wide quarantine. Upon receipt of the request, the commissioner shall instruct the district to circulate a petition for ninety (90) days within the district to obtain signatures of at least two-thirds (2/3) of all resident landowners owning at least fifty-one percent (51%) of all resident-owned land. Upon receipt of the properly executed petition, the commissioner shall declare a district-wide quarantine;

(ii) A district board may hold a hearing in compli-

ance with the Wyoming Administrative Procedure Act. The commissioner shall declare a district-wide quarantine when the district has provided the commissioner with proper documentation that a hearing has been held and the district has found a need for a district-wide quarantine;

(iii) The district board may hold a district-wide referendum. The commissioner shall declare a district-wide quarantine upon receipt of a certified document indicating that the referendum was accepted by a majority of the electors who voted in the election.

(c) The commissioner shall declare an individual quarantine when requested by resolution adopted by a two-thirds (2/3) majority of the board.

(d) The district board in compliance with W.S. 11-5-101 through 11-5-119 may request a quarantine against the entry of infested farm products that may be injurious and detrimental to the state and enter into agreements with the law enforcing agencies to carry out the quarantine provision:

(i) Farm products and equipment shall be certified free of designated noxious weed seeds or infested farm products prior to entry into the state, with the exception of any processed feed or grain to be reprocessed and fed to livestock;

(ii) Farm products and equipment are to be certified in the state of origin by the proper officials;

(iii) Interstate shipment of farm products through the state need not be certified if covered in a prescribed manner as not to allow the dissemination of infested farm products.

11-5-117. Criminal provision; penalty. Any person violating any provision of this act is guilty of a misdemeanor, and shall be fined not more than one hundred dollars ($100.00) in addition to fines provided for in W.S. 11-5-109(e).

11-5-118. Inspection for contamination. Farm products and agricultural, commercial or industrial equipment entering or moving within the district are subject to inspection for contamination of designated weeds and pests by the district board through its designated agents. The board and the Wyoming weed and pest council may promulgate rules and regulations which establish inspection standards and remedial requirements under this section.

11-5-119. Rules and regulations. The board, with the approval of a majority of the districts, may promulgate, adopt and publish rules and regulations in accordance with the Wyoming Administrative Procedure Act for the purpose of carrying out the intent of this act.

If any provision of this act or its application to any person or circumstance is held invalid, the invalidity does not affect other provisions or applications of the act which can be given effect without the invalid provision or application, and to this end the provisions of this act are severable.

This act is effective May 25, 1979.

ARTICLE 2
LEAFY SPURGE CONTROL

11-5-201. Leafy spurge control program. (a) A leafy spurge control program is authorized and shall be carried out as provided by this section and legislative appropriation acts. As used in this act [this section] leafy spurge refers to EUPHORBIA ESULA. All state and local governmental entities shall comply with the program.

(b) The program shall be funded by landowner, weed and pest district and state contributions as follows:

(i) Landowners shall contribute twenty percent (20%) of the cost of the treatment program on their land but not to exceed a total cost of sixty dollars ($60.00) per acre;

(ii) Except as provided by paragraphs (i) and (iii) of this subsection, weed and pest districts shall contribute the total cost of the treatment program with the district with funds available under subsection (c) of this section;

(iii) The state shall contribute the total cost of the treatment program on state land plus the amount under paragraph (ii) of this subsection which cannot be funded by a weed and pest district under subsection (c) of this section.

(c) A weed and pest district may levy not to exceed an additional one (1) mill on the assessed value of the taxable property within the district to fund its contributions under this section. Upon request by a weed and pest district the board of county commissioners may levy the amount of tax requested not to exceed the mill levy authorized by W.S. 11-5-111 and this subsection. When no longer needed for the purpose of this section, the county commissioners shall remove the additional levy authorized by this paragraph. Funds necessary to carry out provisions of this act [this section] in excess of the revenue derived from the one (1) mill levy authorized by this subsection shall be funded by the state under paragraph (b)(iii) of this section.

(d) In addition to the penalty provided by W.S. 11-5-109, any landowner who refuses to perform remedial requirements to control leafy spurge after due notice as required by W.S. 11-5-109 is subject to a civil penalty not to exceed one hundred

dollars ($100.00) per day for each day the landowner is in violation but not to exceed a total penalty of five thousand dollars ($5,000.00) per year. The accumulated penalties under this section constitute a lien on the land from the day notice from the weed and pest board is delivered to the landowner. Civil penalties received under this subsection shall be paid to the weed and pest district in which the land is located.

Eight hundred eighty-five thousand dollars ($885,000.00) is appropriated from the general fund to the department of agriculture for the purpose of treating leafy spurge on private lands under this act. Five hundred and fourteen thousand dollars ($514,000.00) is appropriated from the farm loan account within the trust agency fund authorized by W.S. 11-34-202, for the purpose of treating leafy spurge on state lands under this act. The state board of agriculture shall adopt rules and regulations as provided by W.S. 11-5-119 to implement an effective program to control leafy spurge in Wyoming.

This act is repealed July 1, 1984.

This act is effective July 1, 1978.

APPENDIX 7

PUBLIC LAW 90-583
90th Congress, S. 2671
October 17, 1968

AN ACT

82 Stat. 1146

To provide for the control of noxious plants on land under the control or jurisdiction of the Federal Government.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the heads of Federal departments or agencies are authorized and directed to permit the commissioner of agriculture or other proper agency head of any State in which there is in effect a program for the control of noxious plants to enter upon any lands under their control or jurisdiction and destroy noxious plants growing on such land if---

Noxious Plant control.

(1) such entry is in accordance with a program submitted to and approved by such department or agency: Provided, That no entry shall occur when the head of such Federal department or agency, or his designee, shall have certified that entry is inconsistent with national security;

(2) the means by which noxious plants are destroyed are acceptable to the head of such department or agency; and

(3) the same procedure required by the State program with respect to privately owned land has been followed.

Sec. 2. Any State incurring expenses pursuant to section 1 of this Act upon presentation of an itemized account of such expenses shall be reimbursed by the head of the department or agency having control or jurisdiction of the land with respect to which such expenses were incurred: Provided, That such reimbursement shall be only to the extent that funds appropriated specifically to carry out the purposes of this Act are available therefor during the fiscal year in which the expenses are incurred.

Sec. 3. There are hereby authorized to be appropriated to departments or agencies of the Federal Government such sums as the Congress may determine to be necessary to carry out the purposes of this Act.

Appropriation authorization.

Approved October 17, 1968

CONSIDERATIONS FOR IMPLEMENTING PL 90-583 (CARLSON BILL)

(Prepared by Interagency Ad Hoc Committee selected by The Weed Committee of the Department of Agriculture and Interior, and reviewed by representatives from USDA, Interior and Defense Agencies having jurisdiction over Federal lands)

Interpretation of PL 90-583

1. "Heads of Federal departments or agencies" suggest delegation to appropriate field unit administrators directly responsible for resource management and action programs.

2. "Commissioner of Agriculture or other proper agency head of any State" is construed to mean such instrumentality, including weed districts, in those States with effective weed laws and an active noxious plant control program with the coordination responsibility centered in the State Department of Agriculture

3. Authorizes suitable appropriation of funds by Congress to Federal departments or agencies to conduct adequate and effective noxious plant control on federally administered lands in cooperation with those States in which there is in effect a noxious plant control program. This appears to be the key provision of the Act. State control of noxious plants occurring on Federal lands is very unlikely without assurance of reimbursement. Further, improved financing levels would enable Federal agencies to undertake appropriate plant control programs as a normal phase of resource management with or without State cooperation.

Implementation of PL 90-583

1. Documentation of Federal land-managing agencies'-bureaus' known noxious plant control needs in those States with active control programs as a basis for requesting suitable funding for this purpose from Congress.

2. Where cooperative Federal-State control programs are contemplated, determination of annual needs will require close coordination of concerned parties to establish realistic goals within funding ability of each party. Such determination should be accomplished well in advance of Federal agencies' annual budget submission to insure inclusion of this item.

3. Suitable appropriation of funds by Congress for Federal departments', agencies' or bureaus' noxious plant control programs is not to be construed as an obligation to utilize the State, or proper agency head thereof, in the control effort. Purposes of the Act can be fulfilled

by the Federal department or agency performing the needed control work providing it is of a quality comparable to that accomplished by the State program on private lands.

Recommendations

1. Cooperative aspects of action programs involving Federal agency-bureau and State field units to be coordinated and implemented through maximum use of local agreements under existing authorities. Present agreements between federal and states appear to be adequate for purposes of this Act.

2. Concerned Federal departments should request respective agencies or bureaus to contact their State Commissioners of Agriculture (or other proper State agency head) advising them of the agency's or bureau's desire to implement provisions of PL 90-583 and to solicit bureau involvement for FY 1971 with a projection of annual needs for a subsequent 5-year period (through FY 1975).

3. Each Federal agency or bureau to seek appropriations beginning in FY 1971 or as soon thereafter as possible to implement the cooperative control programs developed with those States in which there is in effect a program for control of noxious plants.

4. Consider resolution by appropriate memoranda of understanding between concerned heads of Federal agency or bureau and State in the event that coordination cannot be effectively realized in localized situations.

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225